

The
HOME UNIVERSITY
ENCYCLOPEDIA



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The
HOME UNIVERSITY
ENCYCLOPEDIA

—An Illustrated Treasury of Knowledge—

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WITH SPECIAL ARTICLES AND DEPART-
MENTAL SUPERVISION BY 462 LEADING EDITORS,
EDUCATORS AND SPECIALISTS IN THE
UNITED STATES AND EUROPE

(Revised Edition)

1946

COMPLETE IN TWELVE VOLUMES
VOLUME IV

BOOKS INC.

~~New York~~

NELSON NEW LOOSE-LEAF ENCYCLOPEDIA
FIRST PUBLISHED AND COPYRIGHTED, 1905
REVISED AND COPYRIGHTED, 1934,
BY THOMAS NELSON & SONS, NEW YORK
REVISED, ABRIDGED AND COPYRIGHTED,
1935, 1936, 1937, 1938, 1940, 1941, 1942, 1943, 1944, 1945, 1946
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PRINTED AND BOUND IN THE UNITED STATES OF AMERICA

VOLUME IV

Cossacks

Cossacks, a name meaning 'freebooters' in Turkish, applied to certain military communities in southern Russia, people who formerly had the special duty of guarding the frontiers, and who won the name of being the best light cavalry of the Russian army.

The Cossacks made their first appearance in history about the close of the Middle Ages. They were a mild, gay people who lived an adventurous life and excelled in horsemanship. See Gogol's *Taras Bulba* and Tolstoy's *The Cossacks*.

Their history is closely related to that of Russian progress eastward through Siberia. The Don and the Zaporogian Cossacks were two of the most notable tribes, and actively participated in the exploration and acquisition of Russian territory. Under the Czars, the Cossacks were a military division of the population, who settled in their own villages, but were subject to call by the Imperial Government. Although the Cossacks joined the Revolution of March, 1917, they were frequently engaged in hostilities with the Soviet Government. Since then the policy of the Soviet Government has been to efface the military and political individuality of the Cossacks. See DON COSSACKS TERRITORY.

Cossus, Servius Cornelius, Roman Consul in 428 B.C.

Cot, or **Cotice**, in heraldry. See **Bend**.

Costa, Claudio Manoel da (1729-90), Brazilian poet. He wrote many poems and sonnets both in Portuguese and in Italian, modelled upon Petrarch.

Costa, Lorenzo (1460-1535), Italian painter, known as the 'Perugino of Ferrara,' was born in Ferrara; with his pupil Francia he decorated the chapel of St. Cecilia; several of his altar pieces are in Bolagna.

Costa, Sir Michael Andrew Agnus (1808-84), musical conductor and composer, was born in Naples; he went to England, became director of music at the King's Theatre; conducted the Philharmonic concerts; was knighted; and eventually became director of Her Majesty's Opera.

Costa Rica, a flourishing republic of Central America, extends from the Caribbean Sea to the Pacific Ocean, having Nicaragua on the n. and Panama on the s. It is divided into seven provinces, San José, Alajuela, Heredia, Cartago, Guanacaste, Puntarenas and Limón; area, 23,000 sq. m.

Costa Rica

Except on the coast, the country is generally mountainous, with many volcanoes all under 11,500 ft. On the Atlantic slope, dense forests prevail; but wide savannas are more frequent on the Pacific side. On the Pacific are two extensive bays, the Gulfs of Nicoya and Dulce, and several smaller harbors. The highest peak is Irazu. There is scarcely a sq. m. without a fair-sized stream, and water power is unlimited. Climate varies from tropical at the coast to almost temperate in the higher altitudes. There is a wet and a dry season.

More than one-half of Costa Rica lies between altitudes 2,900 and 6,800 feet, and is covered with luxuriant forest. Bird life is extremely plentiful and of great richness of color. Agriculture is the principal industry. Coffee and bananas constitute 70 and 20 per cent respectively of the exports. All kinds of tropical and subtropical fruits are produced. Cacao is the third ranking export. Among other products are dyewoods, timber, tobacco, sugar, rubber, rice, beans, and corn. The chief ports are Puntarenas, on the Pacific, and Limón, on the Caribbean.

Both ports are connected with the capital by fine railroads. There are postal, telegraph, radio, telephone, and wireless services. In 1930 air mail was inaugurated between San José and Puntarenas and with Central America and the United States. No recent census has been taken. Estimated population (1939) 620,000.

The State religion is Roman Catholic but religious liberty is guaranteed. Elementary education is free and compulsory. Secondary education is offered in schools at San José, Alajuela, Cartago, and Heredia. There are training schools in agriculture, commerce, nursing, and teaching and professional schools of Law, Pharmacy, and Fine Arts.

The government is a constitutional republic. The executive power is vested in a president elected for four years and assisted by seven secretaries. The legislative power is in a Constitutional Congress of 43 deputies. Voting is secret, direct and free.

Discovered by Columbus in 1493, Costa Rica has had much the same history as its neighbors. Its present constitution is the tenth since the declaration of independence in 1821, when the country threw off the Spanish yoke, and joined the Mexican empire of Iturbide. It was one of the states of the

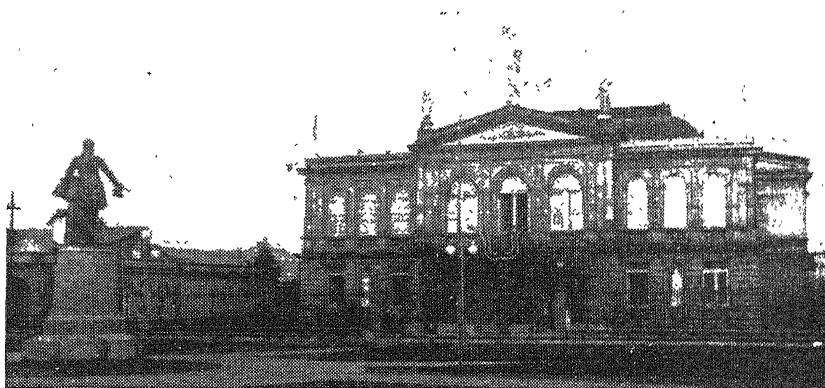
Central American Republic from 1824 to 1829, when it became independent. Costa Rica declared war on Ger. It., and Japan, 1941. See CENTRAL AMERICA

Consult R Villafranca Carazo, *Costa Rica Guide for Tourists*, 1921, W. Thompson, *Rainbow Countries of Central America*, 1926; F G Calderón, *History of Costa Rica*, 1915; U S. *Consular Reports*.

Coster, Lourenz Janszoon (c 1370-1440), reputed inventor of printing by movable types; was born in Haarlem, Holland. Coster's claim is discredited by those who

ber of the job to which they apply. The totals of the tickets and the requisitions, with the percentage for general expenses, make up the cost. Cost accounting through the use of standards has invaded the field. It employs predetermined figures in place of actual costs and the total of such assigned figures is compared with the actual production. This plan is less costly and gives an immediate check on the value of changes and improvements.

Cost of Living, a condition resulting from the relation of prices and income to the



San Jose, Costa Rica. National Theatre.

adopt the cause of Gutenberg. See PRINTING.

Costigan, John (1835-1916), Canadian public official, was born in St. Nicholas, Quebec. Between 1882 and 1896 he was Minister of Inland Revenue, Secretary of State, and Minister of Marine and Fisheries.

Cost Keeping. In all factories it is of the utmost importance to know exactly what each article or class of articles costs, so that the manufacturer can regulate his prices. The general scheme of the American cost system is as follows: Each job is given a number; 'jobtickets' bearing that number are issued to all workmen engaged on that job; each of them writes on his ticket the exact time spent on it; each man's work is then valued by a clerk according to the wages paid to him; and the total of all the tickets bearing the same number shows the cost of labor on that job. To this total must be added a percentage, carefully calculated, to cover management, light, heat, depreciation of machinery, and various general expenses, which cannot be specifically apportioned to particular jobs. Materials used are entered and priced on 'requisitions,' also bearing the num-

standard of living. From 1896 through the war the rise in the cost of living was almost world-wide, resulting in an increasing interest in the subject and much discussion as to its causes. Before 1913 isolated cost of living studies were made but no attempt was made to keep records over a period of years to show the changes.

An extensive study of the cost of living for wage earners in the United States in 1890 and 1891 was made by the Department of Labor. It applied only to wage earners in the following industries: iron, steel, bituminous coal, coke, iron ore, limestone, cotton goods, woolen goods, and glass. The findings of the investigation were published in the sixth and seventh annual reports of the Commissioner of Labor. A later study was made in 1901-02.

In 1918-1919 the U. S. Department of Labor undertook another investigation 'working in coöperation with the National War Labor Board . . .'. This investigation covered white families in 92 cities or localities in 42 States, the cities varying in size from New York to small country towns of a few thou-

sand population. In selecting these places it was the aim of the bureau to get representative data that would show living conditions in all sections of the country and in all kinds of localities. The families studied represented the wage-earning and low and medium salaried families. It was found that on an average 38.2 per ct. of the total income went for food, 16.6 per ct. for clothing, 13.4 per ct. for housing, 5.3 per ct. for fuel and light, 5.1 per ct. for furniture and furnishings, 21.3 per ct. for miscellaneous. A study of 96 academic families made by Miss Peixotto in California showed a different distribution of expenditures at a slightly higher income level with a different standard of living.

In the U. S. living costs descended sharply 1929-33, then rose to 1937. With the entry of the U. S. into World War II living costs rapidly developed an inflationary design. In an effort to prevent inflation the OPA (q.v.) put into effect May 18, 1942, a General Maximum Price Regulation, providing ceilings for 60 per ct. of foods as well as many other commodities. The cost of food continued to rise, however, due to price rises of uncontrolled foods. See Douglas's *Real Wages in the United States* (1930), and U. S. Bureau of Labor Statistics.

Costs, in law, a term employed to denote expenses incurred in judicial proceedings. As a general rule, the unsuccessful party is obliged to pay the costs of the successful party.

Costus, a genus of perennial herbaceous plants, belonging to the order *Zingiberaceæ*, which occur in the tropical areas of the Old and New Worlds.

Cosway, Richard (1742-1821), British miniature painter, was born in Devonshire, was appointed painter-in-ordinary to the Prince of Wales, and Mrs. Fitzherbert and the other beauties of the coterie sat to him.

Côte-d'Or, department, Southeast France, formed out of the old province of Burgundy; area, 3,391 sq. m. The three river basins of the department are those of the Rhone, the Seine, and the Loire. On the slopes of the Côte-d'Or ripens the grape which has made the wines of Burgundy famous. Other products are wheat, beet sugar, tobacco, oats, barley and potatoes. Coal, iron, and hard building stone are found; p. 328,881.

Cotentin, The, the peninsula, projecting from the n.w. of Normandy into the English Channel, between the Bay of St. Michel and the Gulf of Carentan.

Côtes-du-Nord, department France, forming part of Brittany, and bordering on

the English Channel for 70 m.; area, 2,787 sq. m. Off the coast, which is steep, rocky, and much indented, are the Sept-Iles, Brehat, and other small islands. The principal bays are St. Malo and St. Brieuc. The department is noted for its horses. Market gardening for Paris and London is developing but the chief occupation is fishing in the English Channel, the North Sea, round the shores of Iceland, and even off Newfoundland and great quantities of sardines are preserved; p. 557,824.

Cotillon, the name of a brisk dance, of French origin, performed by eight persons, of which the quadrille may be regarded as a modification. It later developed into a form of round dance, long and elaborate, danced to the music of waltzes, polkas, mazurkas, and galops.

Cotinga, or **Chatterer**, a genus of Passerine birds, represented by a number of species in Central and in tropical South America.

Coto Bark, a bark obtained from a large tree grown in Bolivia. The bark which has a pungent, bitter taste is sometimes employed as a powder or tincture for diarrhœa and neuralgia.

Cotoneaster, a genus of plants of the order Rosaceæ, sub-order Pomeæ, closely allied to the hawthorn and medlar

Cotopaxi, the loftiest active volcano in the world, situated in Ecuador, in the eastern chain of the Andes, about 50 m. s. of the Equator. The first eruption recorded was in 1533. Others followed in 1698, 1743, 1744, and in 1768, the most terrible of all. In 1803, 1854, 1855, 1856, 1864, and 1877 eruptions also occurred.

Cotrone, seaport and episcopal see, Italy, in the province of Catanzaro. It has a cathedral, a citadel, and a small but good harbor, and exports oranges, olives, wine and licorice; p. 10,000.

Cotrone, one of the powerful Greek cities of South Italia, was founded in 710 B.C. It gave many champions to the Olympic games, chief among whom was Milo.

Cotswold Hills, a range of oolitic limestone hills, running through the middle of Gloucestershire, England. They are over 50 m. long, with an average height of 500 or 600 ft., and separate the Lower Severn from the Thames.

Cotta, German publishing firm, founded in Tübingen by Johann Georg Cotta in 1659. It first became famous under JOHANN FRIEDRICH, BARON COTTA VON COTTENDORF, 1764-1832, great-nephew of Johannes Friedrich

Cotta, 1701-79, chancellor of the University of Tübingen. Johann Friedrich undertook the family business in 1787; and in 1795 he established the famous *Horen*, a literary journal, under the editorship of Schiller, with the coöperation of Goethe and Herder. He published also the works of Schiller, Goethe, Herder, Fichte, Schelling, Jean Paul, Tieck, Voss, and the Humboldts.

In 1810 Cotta removed to Stuttgart, and in 1824 introduced the first steam printing press into Bavaria. As president of the Second Chamber he was the fearless defender of constitutional rights, and was the first Württemberg proprietor who abolished servitude on his estates. He was succeeded by his son, GEORG, 1796-1863, who was in turn succeeded by his son CARL, 1835-88, during whose administration several of the branches were sold.

Cottabato, Cotabato, or Kota-Batu, military district. Mindanao province, Philippine Islands.

Cottar. See **Crofter**.

Cotter, a tapered metal bar driven through a slot in the projecting end of a tie bar or fastening pin, to prevent its withdrawal.

Cottet, Charles (1863-1925), French painter, was born in Puy, Haute-Loire. He reached the full development of his powers in his fine triptych in the Luxembourg in Paris, one of the series of the 'Pays de la mer,' a cycle of ten landscapes that marks a date in the history of French art.

Cottian Alps, the name given to that portion of the main chain of the Alps which extends between the Maritimes and the Graians. It falls naturally into five districts: (1) The Chambeyron group, which extends from the Col d'Argentière on the s. to the Col de Longet and culminates in the Aiguille de Chambeyron. (2) The Viso group, from the Col de Longet to the Col de la Traversette. (3) The Waldensian Valleys, from the Col de la Traversette to near the Mont Genève. (4) The Genève district, or hills on either side of the pass of the Mont Genève. (5) The Ambin group, which extends from near the Mont Genève to the Mont Cenis and culminates in the Aiguille de Scolette or Pierre Menue. See **ALPS**.

Cottle, Joseph (1770-1853), English bookseller, started business in Bristol, 1791; published Southey's *Joan of Arc*, bore the expenses of Coleridge's paper, the *Watchman*, and published the *Lyrical Ballads* of Coleridge and Wordsworth. Consult his *Re-*

collections; Southey's Life and Correspondence

Cotton, a plant of the genus *Gossypium*, a member of the Malvaceæ, or mallow family, and the fibre which it produces. This fibre is one of the most important vegetable products, and on account of its characteristic spiral thickening is readily distinguished from all other fibres, and is especially adapted to spinning. Cotton has been known from remote times, as is shown by the writings of Herodotus, Pliny, and other early



The Cotton Plant

historians. It is certain that it was in use in India 3,000 years ago, and in Egypt more than 2,000 years ago. Mummy wrappings from Peru testify to its use in that country many centuries ago, and the earliest voyagers to the Western Hemisphere found it in use in several countries.

More than fifty species of cotton have been described, but only four are of great economic importance—namely, (1) *Gossypium barbadense*, the source of Egyptian Cotton and of the Sea Island Cotton of South Carolina, Georgia, Florida, and the West Indies; (2) *G. hirsutum*, or American Upland Cotton, grown chiefly throughout the region from Virginia to Oklahoma southward, and forming about 99 per cent. of the American crop; (3) *G. herbaceum*, the Upland Cotton of India, found also in China, Arabia, Persia, and Africa; and (4) *G. neglectum*, or Bush Cotton, which forms the bulk of the Indian product, and is the source of the 'Dacca cotton' from which the India muslins and the long cloth of Madras are made.

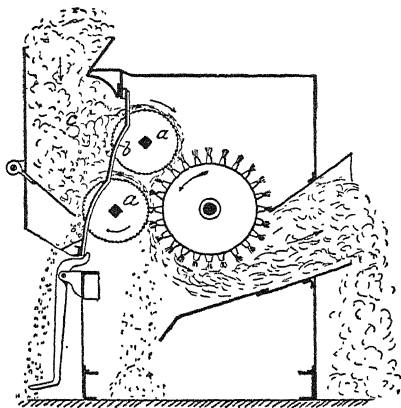
Although varying widely in the different species and the different countries, the cotton plant may be described generally as a

shrub of from three to six feet in height, with spreading branches diminishing in length toward the top of the main stem; alternate, more or less lobed leaves; and white, yellow, or red hollyhock-like flowers, surrounded by three or four heart-shaped green bracts. Nearly all the important species are perennial in warm climates, but under cultivation they are best treated as annuals. A few days after blossoming the flowers fall to the ground, leaving within the calyx a tiny boll, or capsule, which is divided into a number of cells containing the seeds and the fibre which forms the cotton of commerce. On reaching maturity the bolls, then from $\frac{3}{4}$ to $1\frac{1}{2}$ inches in diameter, burst open, and the cotton is ready for picking. The value of cotton for spinning depends upon the ripeness, length, fineness, and strength of the cotton fibre, and these qualities form the basis of the commercial classification.

Cultivation.—For its best production cotton requires a long growing season, with plenty of sunshine, a deep, mellow, rich soil, and a hot, steamy atmosphere, with abundant moisture during the period of greatest growth, and a dryer atmosphere during the ripening and gathering of the crop—conditions found in the Southern States of the United States to a higher degree than anywhere else in the world. In planting, the common custom is to bed up the land by ploughing down a field and back again, throwing the two furrows together, thus securing good drainage and permitting an economical use of fertilizers. The seed is drilled in rows about 4 ft. apart, and when the plants have attained a height of 3 or 4 inches they are 'chopped,' or thinned out, so as to stand 12 to 14 inches apart in the rows. Cultivation to keep the ground free from weeds and to minimize evaporation from the soil is begun at this time, and repeated at intervals until July or August, when the crop is 'laid by' to mature. Most of the crop is planted by May 20; blooming begins about two months after planting and the first bolls are ripe about six weeks later. The picking begins six or eight weeks later. Picking is done by hand, largely by colored labor, and requires frequent going through the fields as the bolls mature and open. It may be prolonged until well into December. Machine picking has been tried, but is yet to be perfected.

After picking, the cotton, which contains all the seeds and is known as seed cotton, is

taken to the gin, which separates the fibre from the seed, the lint being baled ready for market and the seed saved for some of the numerous by-products, as cotton seed oil and cotton seed meal. See COTTON SEED. In some parts of the world primitive machines are still in use—for example, the Churka Gin common in India. In the United States, the Roller Gin is used with Sea Island cotton, but the process is considered too slow and expensive for Upland cotton, the greater part of which is separated by the Saw Gin, invented in 1792 by Eli Whitney. After ginning the cotton is compressed into a bale, and the bales are covered with jute bagging and bound by steel bands. If they are to be shipped long distances, they are further compressed at a railroad centre or seaport.



Saw Gin.

Cotton is occasionally marketed as seed cotton, but is more commonly ginned and baled before selling. It may be purchased directly, in which case the transaction is known as a 'spot sale'; or contracts allowing for the purchase of the cotton on the basis of future delivery may be bought and sold through the leading cotton exchanges located in New York, New Orleans, and Liverpool. The great bulk of the fibre yield of the cotton crop is devoted to the manufacture of cotton cloth and yarn. Other important uses are in the manufacture of cotton wool and of high explosives.

Cotton Wool consists of the hairs of the seed of *Gossypium barbadense* and other similar species. After being separated from the seeds and cleansed from impurities, the mass of fibres are boiled in dilute caustic potash to remove all waxy and fatty matter. They

are then washed and bleached by the action of bleaching powder and hydrochloric acid, and again washed and dried. The hairs are separated by a current of air and collected as a soft, fleecy wool. The wool thus prepared possesses absorbent properties, and after thorough sterilization and impregnation with disinfectants—as corrosive sublimate, boric acid, or iodoform—is largely used as a dressing for wounds.

The cotton fibre and linters are almost pure cellulose, and are of great importance in the manufacture of explosives. They form the principal constituent of guncotton and

ning process the cotton must be prepared. After a bale has undergone a second compression prior to shipment, the cotton is very closely matted together. It is therefore passed through a Bale Breaker, consisting of a series of heavily weighed and spiked rollers which vary in speed and thus pull the cotton apart in lumps, or through a hopper breaker in which a spiked lattice takes the place of rollers. From the bale breaker the cotton is carried by means of a traveling lattice or exhaust air tube to the blending or mixing room, where cotton from many bales is mixed, either by hand or machinery, in order



A Cotton Field.

smokeless powder, which have largely supplanted other materials as propulsive ammunition. In World War I the consumption for this purpose was estimated at 3,000,000 bales per annum, and in World War II it was much larger. See EXPLOSIVES; GUNCOTTON; GUNPOWDER; CONTRABAND OF WAR.

The cotton stalk is used as fuel and for making paper. The linters, separated from the seed by a special form of gin, enter into the manufacture of low grade yarns, twine, batting, cheap rope, lampwicks, and filling for mattresses, cushions, and upholstery. The hulls are used for stock feed and fertilizers and in paper mills. The seed itself is the source of cotton seed oil and meal. See COTTON SEED.

There are two separate industries in the manufacture of cotton—spinning and weaving—though both are often carried on in the same establishment. Prior to the actual spin-

ing process the cotton must be prepared. After a bale has undergone a second compression prior to shipment, the cotton is very closely matted together. It is therefore passed through a Bale Breaker, consisting of a series of heavily weighed and spiked rollers which vary in speed and thus pull the cotton apart in lumps, or through a hopper breaker in which a spiked lattice takes the place of rollers. From the bale breaker the cotton is carried by means of a traveling lattice or exhaust air tube to the blending or mixing room, where cotton from many bales is mixed, either by hand or machinery, in order

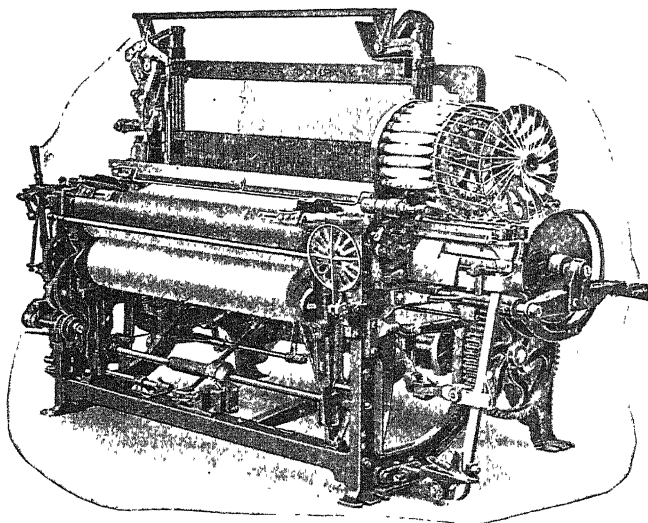
to obtain, as nearly as possible, uniformity in color and in length and quality of staple. After mixing, the cotton is passed directly or through a hopper feed, into an opener or breaker picker, where it is beaten by spikes or knives which still further open and loosen it, and is driven against cleaning bars which remove the great bulk of the impurities, as dirt and leaves. From here it is carried in the form of a lap or loose sheet of cotton to an intermediate picker which unites several laps, continues the opening and cleaning process, and delivers the cotton to the finisher picker or scutcher. The finisher picker again unites several laps, further cleans the cotton, and passes it on to the carding machine.

Up to this point the cotton retains its original form, the fibres crossing and recrossing in innumerable directions in a loosely woven mass. In the carding machine the first attempt is made to treat the fibres individually.

Small impurities are removed; broken, immature, and stained fibres are eliminated, and the remaining fibres are disentangled and laid approximately parallel. The revolving top flat card is the machine in general use for carding, having practically displaced the roller card and the stationary flat or Wellman card formerly used. When very fine yarns are desired, the carding process is repeated, and the product is known as 'double carded.' A combing process may also be inserted at this point, which removes all short fibres and leaves the remainder of equal length and parallel. The strength of yarn depends largely

above, only on a much finer scale, and is known as roving. For fine work a second roving frame, called a pack frame, is sometimes employed. The product of the foregoing operations is a loose, fibrous roving with just sufficient twist to prevent its breaking as it is taken from one process to another. The actual spinning completes the drawing out and imparts additional twist, transforming the roving into a finished yarn. Two systems are in general use—ring spinning and self-acting mule spinning.

Ring spinning frames are double-sided machines, each side carrying a long line of



Northrop Automatic Loom.

upon its evenness and upon the parallelism of the fibres. To correct any inequalities in the slivers, a number are now run through the drawing frame, the essential feature of which is pairs of rollers moving at unequal and increasing speed. The result is a single sliver of the same weight per yard as each of its parts. Slivers which have passed through the drawing frame now go through a series of fly frames. In the slubber—the first of these—they are further attenuated, twisted slightly to allow them to be drawn out still more without breaking, and wound upon bobbins. The bobbins of slubbing now go to the intermediate frame, which is similar to the slubber, and the strands are further drawn out and twisted.

The next process is a repetition of the

spindles—a hundred or more—suitably spaced. Crossing the length of the frame is a movable plate having at regular intervals holes, in each of which is fixed a metal ring through which a spindle passes. Children or women usually manage these machines. The yarn produced is round and hard, but somewhat irregular on account of the variable tension. Self-acting mules are employed when fine, soft, elastic yarns are desired; but the process is more expensive than ring spinning, and the product per spindle is less. The chief features of the spinning mule are the head-stock, a strong framework consisting of two upright frames connected by cross pieces, and containing the mechanism; the movable carriage carrying the spindles and faller rods; and the creel and rollers which are parallel

with the carriage. Only men or strong women can manage these machines, each of which may have as many as 1,500 spindles.

Weaving is the process by which the yarn is made into cloth. The first step preparatory to weaving is the rewinding of the yarn from the cops or ring bobbins onto the warper's bobbin: the cops, as they are emptied, being replaced by new cops and the ends attached. When a sufficient number of warping bobbins have been wound, they are passed on to the beam warper. Here they are placed in a creel, and the threads from all the bobbins are taken separately through reeds and combs and attached to a barrel or beam known as the 'slasher beam,' which is made to revolve by frictional contact with a driving drum. The ends from the bobbins in the creel are thus drawn off and coiled round the slasher's beam in parallel order in one broad sheet. In the event of a thread breaking during the beam-warping process, the machine stops automatically.

A number of these beams now go to the 'slasher' and are run through a box containing a glutinous liquid known as size, in order that the fibres issuing from the spun thread may be laid flat. The operation also serves to strengthen the thread to withstand the strain and friction of weaving, and the increase in weight is considerable. Leaving the back beams, the yarn is dipped into the size by an immersion roller, and is then passed through squeezing rollers, which press out all superfluous matter. After emerging from the size box, the sheet of threads is passed between steam-heated cylinders, which help to dry them. The drying is further effected by revolving fans; and the threads then pass through dividing rods, which separate them, and are wound on to the warp beam or weaver's beam, ready for the loom. From this machine the weaver's warp is taken to the 'twisting-in' or the 'drawing-in' frame. Twisting-in consists in attaching the threads of the new warp to the threads of an old warp, which are already drawn through a set of heddles, or harnesses, and reeds, which determine the number of warp threads to one inch, and also the particular method in which the warp threads shall interweave with the filling as the latter is shot through in the shuttle during weaving. Drawing-in or loom-ing is a process whereby the threads in the new warp are drawn directly through the 'eyes' or 'mails' of the heddles by means of a hook. The threads are drawn in that particular order necessary for the pattern or

weave of cloth, after which they are passed through dents or splits in the reed. The warp is now ready for the weaver.

The method of preparing warps for colored goods is somewhat different. Whereas in the gray system the threads are all of one color, in the colored system threads of various colors have to be arranged in various proportions for the particular pattern or combination of colors desired. In the process most commonly followed the warp twist is obtained in the gray bundle or hank from the spinner, and is then dyed and sized to the required colors, the colored threads being then wound from the hank on to a warper's bobbin by a drum winder. After a sufficient number of bobbins of various colors have been wound, they are taken to the warping machine and placed in the creel in the order necessary to form the desired pattern for the cloth. Two distinct methods of warping may be mentioned—'mill warping,' which is effected by a large revolving reel, and 'sectional warping,' which is accomplished by running a section of a full warp at a time on to a cheese or block in a narrow coiled sheet or lap.

To produce cloth, three distinct operations are necessary; these are known as the three primary movements. They are (1) opening the shed, or making a division in the warp threads by means of the heddles for the shuttle to pass through with the weft; (2) picking through the shuttle containing the weft; and (3) beating up the weft. In the hand loom the first is effected by the action of the weaver's feet on the treadles, connected to long and short levers, which thus raise and depress the heddles, in order to form a division in the warp threads. The second operation is performed by a picker in the shuttle-box, on each side of the slay, which is connected by a string to a picking-stick in the weaver's hand; the weaver works the stick alternately from left to right and from right to left, and so propels the shuttle from one shuttle-box to another. The third operation is effected by the slay, which is pushed backward and forward with one of the weaver's hands. When it is held back with one hand, the weaver opens the shed by means of the foot and treadles, and with the other hand (which holds the picking-sticks) propels the shuttle through. As soon as the shuttle passes clear of the shed, the slay or batten which carries the reed and shuttle-boxes is brought forward, and the pick of weft which has just been inserted is forced

to its proper place. The warp is fixed in suitable brackets at the back of the loom, and, after passing over a roller, is held in the horizontal position, sufficient tension being given by means of weights and ropes at the back. As the fabric is completed it is wound onto a web or merchandise beam.

The essential features of the power loom are the same as in the hand loom. The first primary movement is effected by means of the tappet, by means of specially prepared cams, lattices, or cards, whereby the heddles or harness through which the warp threads are drawn are so moved that divisions or sheds are formed, and as the weft is inserted a pattern or weave is obtained in the cloth. The second primary movement is performed by the picking motion: by a combination of levers an alternate movement of the shuttle from one side of the loom slay to the other is obtained. The third primary is accomplished by the batten or slay which carries reed and shuttle-boxes. The backward and forward swing is obtained by a connection with a crank on the loom shaft. The parts are set to operate in the same order as for the hand loom.

Other auxiliary motions attached to the power loom are the weft-fork mechanism for stopping the loom automatically if the weft breaks, the take-up motion for determining the speed of warp and picks per inch as the loom is weaving and winding the cloth on to a roller at the front of the loom, and various checking motions for operating more than one shuttle containing differently colored wefts. After leaving the loom and before they are ready for the market, the great bulk of cotton goods undergo a finishing process, as treatment with glycerin, fats, oils, and waxes to impart a soft, supple quality; with starch to give stiffness and weight; with mucilage, gums, and ammonia water to give a glossy finish; or with clay or some similar substance to produce a solid appearance. Gray goods may be used in the gray state, or may be bleached, dyed, or printed. The silky finish of mercerized cotton is attained by a special treatment of the yarn.

In addition to its use in the manufacture of woven fabrics, cotton yarn is used extensively for lace making, sewing thread, and knitted goods. For lace and thread the yarn as it comes from the spindle is often doubled, two or more strands being twisted into one. For the ordinary sewing thread of commerce six or nine strands are thus united; and in order to produce a perfectly smooth prod-

uct, such thread is often passed at high speed through a flame which burns off the fuzz formed by the ends of the fibres—a process known as 'gassing'. Knitted cotton goods, as underwear, hosiery, and gloves, are manufactured by machines so constructed as to knit parts of a particular shape, which are then cut and sewed together on specially designed machines. See KNITTING.

The cotton plant is subject to the destructive attacks of a number of diseases and insects. Among the more troublesome diseases is the wilt due to the fungus *Neocosmospora vasinfecta*, which is widely distributed over the cotton belt, especially in the sandy soils of the coastal plain. It is variously known as Blight, Frenching, Black Heart, and Black Root. The fungus enters the plant from the soil, penetrates the vascular system of the root, and grows upward into the stem, plugging the water-conducting cells, and causing the plant to become stunted or die. The disease spreads slowly, but its infection of the soil is permanent, and the use of resistant cotton varieties is the only practicable means of relief. Root Knot, a disease caused by the nematode *Heterodera radicales*, which penetrates the roots, causing irregular swellings and galls, often occurs in association with wilt. Another serious fungus trouble occurring throughout the cotton-growing sections of the United States, and causing an annual loss of several million dollars, is *Anthracnose*, caused by *Glomerella* or *Colletotrichum gossypii*. This fungus, which is a mould-like growth of microscopic size, attacks the cotton bolls, the young seedlings, the stems, and the boll pedicles. The boll injury, commonly called *Boll Rot*, is the most serious form of disease. It kills or dwarfs the bolls, and discolors the cotton or causes it to decay. Remedial measures consist in the selection of healthy seed, the rotation of crops, and the planting of resistant varieties.

Of the insect pests that attack the cotton plant, the *Boll Weevil* is the most important in the United States. Introduced into Texas from Mexico about 1892, it has spread rapidly, extending the field of its depredations into Louisiana, Mississippi, Arkansas, Oklahoma, and Alabama, and seriously threatening the future of the cotton crop. The insect multiplies rapidly. No sure remedy has been discovered, but the Government has made considerable progress in the study of new methods of control. Moreover, by teaching diversification it has led to enormously increased crop values throughout the South.

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Early planting, and the use of the chain cultivator are helpful. See BOLL WEEVIL.

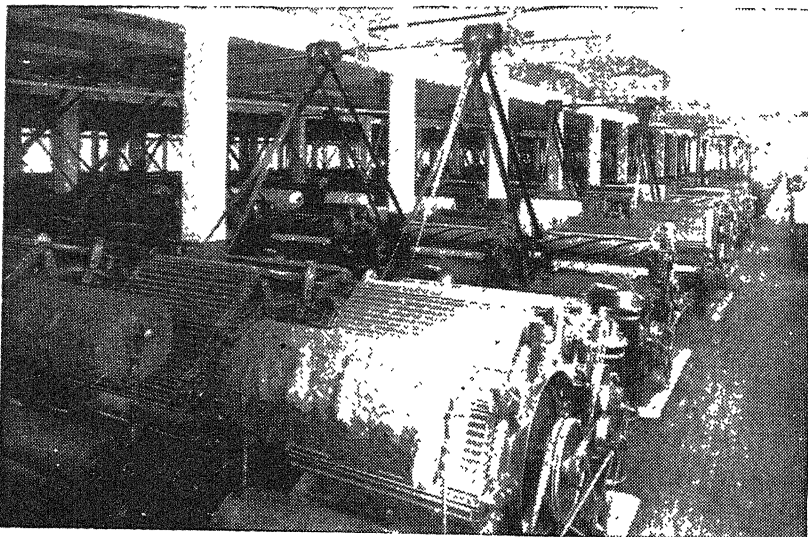
Another important enemy of cotton in the United States is the *Cotton Bollworm*, identical with the earworm of corn and the tomato fruit worm.

The *Cotton Worm* (q.v.) also does considerable damage to the cotton crop, destroying the foliage and occasionally the outer surface of the bolls and even the twigs.

Cotton presents one of the major agricultural economic problems in the U. S. The Dept. of Agriculture announced a carryover

Glossary, 1914; P. H. Nystrom's *Textiles*, 1916; T. Thornley's *Cotton Spinning*, 3d ed., 1916; J. A. B. Scherer's *Cotton as a World Power*, 1916

Cotton, Charles (1630-87), English poet and translator, was born in Beresford, Staffordshire. He was an enthusiastic gardener and angler, and a friend of Izaak Walton, to the fifth edition of whose *Compleat Angler* he contributed a treatise on fly fishing. His other works include. *Scarronides, or Virgil Travestied*; *The Planter's Manual*; and a translation of Montaigne's *Essays*.



Cotton Mill, Carding Machinery.

of 10,656,952 bales from the 1940-1941 crop on Aug. 1, 1943. The new crop (1943) coming in was estimated at 11,478,000 bales. Average annual domestic consumption (1932-1941) was 12,474,000 bales. During World War II ways of growing cotton in various colors were developed in Russia.

Bibliography.—Consult Bulletins, U. S. Department of Agriculture; C. W. Burkett and C. H. Poe's *Cotton*; E. C. Brooks' *The Story of Cotton*. Diseases and insect pests are discussed in *Farmers' Bulletins* of the U. S. Department of Agriculture, and of the Plant Industry Bureau. Statistics are given in the *Bulletin on Cotton Production and Distribution*, issued annually by the U. S. Census Office.

For cotton textiles and manufactures, consult H. B. Heylin's *The Cotton Weaver's Handbook*; F. P. Bennett's *A Cotton Fabrics*

Cotton, Charles Stanhope, (1843-1909), American naval officer, was born in Milwaukee, Wis.

Cotton, George Edward Lynch (1813-66). Anglican clergyman and educator, was born in Chester; became assistant to Dr. Arnold at Rugby, furnishing the model for the 'young master' in *Tom Brown's School Days*. In 1858 was consecrated bishop of Calcutta. The most noteworthy event of his episcopate was his foundation of schools in the hills for the children of poorer Europeans, who could not afford to send their children home to be educated. He was drowned in the Ganges. Consult *Memoir* by his wife.

Cotton, John (1585-1652), English nonconformist divine, was born in Derby. Accused of nonconformity, 1633, to escape Archbishop Laud's persecutions he with some others proceeded to the colony of Massachusetts

Bay; and until his death he was teacher of the First Church in Boston. Here he drew up an abstract of the Mosaic law for Massachusetts, the civil laws of which he also helped to frame. He was a prolific writer, much of his writings being controversial, and relating particularly to the Antinomian controversy and the so-called Roger Williams controversy, in which he defended the course of Massachusetts Bay. Among his publications are: *The Bloody Tenant Washed and Made White in the Blood of the Lamb*, 1647; *Spiritual Milk for Babes*, 1646.

Cotton, Sir Robert Bruce (1571-1631), English antiquary, was born in Denton, Huntingdonshire. Repairing to London, he began to collect valuable manuscripts and other treasures, and his house became the resort of the antiquaries and learned men of his time. Cotton was knighted, he entered parliament, and was later created a baronet. He was in almost constant opposition to the dominating thought. When Wentworth discovered that the ms. of an ironical pamphlet entitled, *A Proposition for his Majesty's Service to Bridle the Impertinency of Parliament*, was in Cotton's library, he caused Cotton to be arrested and dispossessed of his library; this so affected his health and spirits that he died in less than two years. A number of his writings were collected and published in 1657 as *Cottoni Posthuma*. His magnificent library was restored to his son, and at a later period passed into the hands of the nation. It was partially reduced by fire in 1731, and in 1753 it was placed in the British Museum.

Cotton Famine, an industrial crisis occurring at the time of the American Civil War, when the cotton mills of Lancashire, England, drew 85 per cent. of their supplies of raw material from the Southern United States. At the outbreak of the Civil War, as soon as the blockade of the Southern ports by the Federals became effective, little cotton was brought to Lancashire, and the mills were forced to shut down. During 1862 great distress was experienced by the cotton operatives, and various relief committees were formed. By November, 258,357 persons were receiving benefit from boards of guardians, and 200,084 from relief committees.

Cotton Gin, a machine to separate the cotton fibre from the seed, invented by Eli Whitney in 1792. Until that time the separating had been done entirely by hand, necessitating long and tedious work, so that his invention virtually meant a complete revolu-

tion in the cotton industry. See COTTON: *Ginning and Belting*; WHITNEY, ELI.

Cotton Grass, any of several species of the genus *Eriophorum* of the order Cyperaceæ or Sedges.

Cottonmouth Snake. See *Moccasin*.

Cotton Seed, an oil-producing seed borne by the cotton plant, the source of cotton seed oil, cotton seed meal, and other products of economic importance. For many years the value of the cotton crop was held to rest solely with the lint or fibre (see *COTTON*), and the seed was allowed to rot or was dumped in large quantities into rivers and creeks adjacent to the plantations. Its possibilities as a source of vegetable oil was first recognized in modern times in Great Britain in 1783, by 1829 a machine for removing the hulls and preparing the seed for the extraction of oil, had been invented in the United States. The utilization of the seed on an economic basis was long deferred, however. The industry rose most rapidly in France, where it was fairly well established by 1852. Since that time growth has been rapid until the manufacture of cotton seed products now ranks among the leading industries of the country.

As gathered, cotton is composed of about one-third lint and two-thirds seed, by weight, each boll containing from 32 to 36 seeds almost hidden by the mass of white fibre which constitutes the cotton of commerce. The seed is irregularly egg shaped, and hardly larger than an apple seed. It consists of three component parts: linters, a short fuzz adhering to the seed after the cotton has been ginned; the hull, which is the covering or skin of the seed; and the meat or kernel, which comprises the body of the seed.

After the seed has been separated from the cotton by ginning (see *COTTON*), and cleansed from particles of sand, dirt, and other foreign matter by inclined reels or revolving screens, it is submitted to a second ginning process known as delinting. The delinter removes the greater part of the linters and passes them on to the condenser, where they are formed into rolls ready to be baled in the same manner as the commercial fibre. They are used as a filling for mattresses, cushions, and horse collars, in the making of absorbent cotton and cotton batting, for low-grade yarns from which lampwicks, twine, and carpets are made, and in the manufacture of munitions, as gun-cotton and nitro-cellulose.

The hulls are next loosened and detached from the kernels by a machine fitted with

sets of knives which cut the seed into small pieces. The mass of broken meats and hulls is fed into a separator, the chief feature of which is a revolving wheel covered with wire screen, which collects the hulls and permits the greater part of the kernels to pass through. The hulls are palatable and rich in the nutrients that furnish heat and fat, and are used chiefly as cattle food, their food value being about half that of ordinary grass or hay.

Cotton Seed Oil, extracted from the meat or kernel, is the most important product of the cotton seed. It constitutes from twenty to twenty-five per cent. of the kernel, and may be extracted by the expeller method, in which the kernel is pressed cold, or by the more common hydraulic method, which requires the application of heat. In the latter method the meats are first crushed by pairs of chilled iron rollers to rupture the oil cells, and are then placed in heaters or cookers. In these the crushed meats are cooked for from fifteen to forty minutes. They are then formed into cakes of a uniform shape and size, wrapped in camel's hair cloth. These cakes are passed through hydraulic presses that extract the oil and deliver it to a settling tank from which it is pumped, directly or through a filter press, to storage tanks.

The oil thus obtained is a semi-drying crude liquid of a dark brownish or reddish color, composed chiefly of the glycerides olein, stearin, and palmitin. Its specific gravity is about 0.930 at 15° C. It is refined by the addition of caustic soda, which coagulates all impurities and saponifiable matter, causing them to settle at the bottom of the tank. This residue, known as cotton seed foots, forms the basis of cotton seed soap and washing powder. It contains also a quantity of glycerin, which may be extracted and used in the preparation of nitroglycerin, in the manufacture of candles, and for medical purposes. The refined oil is next washed to remove any excess alkali, and is then ready for shipment as summer yellow, largely used in the manufacture of oleomargarine and for packing sardines. Summer white, obtained by bleaching summer yellow with fuller's earth, is the basis of compound lard. Winter yellow and winter white, prepared by subjecting the corresponding summer oils to cold pressure, are excellent salad and cooking oils, and are often sold as true olive oil. The poorer grades are used for soap making and as miners' oil.

After the oil has been expressed from the

cotton seed, the crushed meats remaining constitute what is known as cotton seed cake. This is broken into small fragments by a cake breaker and marketed as cracked cake, or is ground into meal. Cotton seed cake and cotton seed meal are rich in protein (40 per cent.), carbohydrates (35 per cent.), and fat (8 per cent.), and consequently rank high as food for horses, cattle, and sheep. Cotton seed meal is also an excellent fertilizer, furnishing 6.5 to 7.5 per cent. of nitrogen, 1.5 to 2 per cent. of phosphoric acid, and 2 to 3 per cent. of potash.

Statistics.—The manufacture of cotton seed products is carried on in all the large cotton-producing countries—India, Egypt, Asiatic Russia, Turkey, China, Mexico, Brazil, Peru, and the United States. Among other countries, only Great Britain and Germany have developed the industry to any considerable extent. See COTTON.

Bibliography.—Consult L. L. Lamborn's *Cotton Seed Products*; C. W. Burkett and C. H. Poe's *Cotton*; L. A. Ransom's *The Great Cotton Seed Industry of the South*.

Cotton Stainer, an insect with a long beak which sucks the sap from cotton bolls and does much injury to the cotton by staining the fibre with a yellowish red excrement.

Cotton State, a popular name for **Alabama**.

Cotton Whigs. See **Conscience Whigs**.

Cottonwood. See **Poplar**.

Cotton Worm, a common name for the caterpillar of an owlet moth, which is in some years very destructive to the cotton crop of the United States.

Cotyledon, in botany, is the lobe within the embryo of the seed.

Cotyledon, a genus of succulent plants, of the order Crassulaceae.

Coucal, a ground cuckoo of the genus *Cenropus*, found in the warmer parts of the Old World.

Couch, Sir Arthur Thomas Quiller (1863-1944), English novelist and critic, known under the pseudonym 'Q', was born in Cornwall. Among his publications are: *Nicky-Nan, Reservist*, 1915; *On the Art of Writing*, 1916; *Mortallone and Aunt Trinidad*, 1917; and a monograph on *George Eliot*, 1900. He has edited several anthologies, including the *Oxford Book of Victorian Verse* and *Oxford Book of English Verse*. In 1897 he completed Stevenson's romance of *St. Ives*. He was knighted in 1910.

Couchant. See **Heraldry**.

Couch Grass, known also as **Quitch** or

Twitch Grass, is a widespread and troublesome weed, a species of grass with a creeping underground stem.

Coudersport, borough, Pennsylvania, county seat of Potter county, on the Allegheny River. Manufactures include flour, condensed milk, furniture, leather, barrels, rubber goods, surgical supplies, mangle rollers; p. 3, 197.

Coudert, Frederic René (1832-1903), American lawyer, was born in New York City, son of a French Bonapartist refugee; was one of the lawyers who represented the United States before the Bering Sea Tribunal at Paris, 1893-5; and in 1896 was a member of the Venezuelan Boundary Commission.

Coué, Emil (1857-1926), French pharmacist, originator of the system of autosuggestion which bears his name, was born in Troyes. The fundamental feature of his system is indicated in the formula 'Every day in every way I am getting better and better,' the idea being that by constant repetition and concentration of the mind on one thing, that thing can be accomplished.

Coues, Elliot (1842-99), American naturalist, was born in Portsmouth, N. H. From 1863 to 1881 he was a surgeon in the U. S. Army, and was attached to the Northern Boundary Commission and to the Geological Survey. His chief works are: *Key to North American Birds*, 1872; 5th ed. 1903; *Field Ornithology*, 1874; *Birds of the Northwest*, 1874; *Dictionary of North American Birds*, 1882; *The Dæmon of Darwin*, 1884. He was connected, as assistant editor and contributor, with the *Century Dictionary*.

Cougar. See **Puma**.

Cough is generally a reflex act, produced with the object of removing some substance that is irritating a part of the respiratory system. There are many varieties of cough recognized as characteristic of certain conditions. There is the checked, half suppressed cough of pleurisy; the loud, expulsive cough of bronchitis; the nervous cough; besides the more serious cough suggestive of pressure on nerves, and the paroxysm of expiratory efforts ending in the long-drawn, crowing inspiration of whooping cough.

Coughlin, Rev. Charles Edward (1891-), was born at Hamilton, Canada, of American parentage. U. of Toronto, 1911; L.L.D. Notre Dame U., 1933. Ordained Roman Catholic priest, 1916, he taught philosophy until 1922, and since 1926 has been pastor of Shrine of the Little Flower, at Royal Oak, Detroit, Michigan. He has been

widely quoted through his radio sermons on labor and political subjects. He has written *Christ or the Red Serpent* (1930); *By the Sweat of Thy Brow* (1931); *Father Coughlin's Radio Sermons* (1931).

Coulmiers, French village, n.w. of Orléans, where the Bavarians were defeated by the French in 1870.

Coulomb, the practical unit of quantity of electricity, being the quantity conveyed by a current of one ampere in one second.

Coulomb, Charles Augustin de (1736-1806), French physicist and engineer, was born in Angoulême. He is best known as the inventor of the torsion balance for measuring electrical attraction, and as giving his name to the electrical unit of quantity. See **COULOMB**.

Coulommiers, town, France, department of Seine-et-Marne, 45 miles e. of Paris. It was the high-water mark of the German sweep towards Paris, Sept. 5, 1914, but was retaken by the British, Sept. 7; p. 7, 224.

Coulter, John Merle, (1851-1928), American botanist, was born in Ningpo, China. He is the founder, 1875, and editor of the *Botanical Gazette*, and author of numerous works on botany and plant breeding.

Coumarin, or Cumarin, $C_9H_7O_2$, an organic compound occurring in Tonka beans, woodruff, and other plants. It is prepared synthetically by heating salicylic aldehyde with sodium acetate and acetic anhydride, and is a white, crystalline solid with a pleasant smell; sp. gr. .92, m.p. 67° C., b.p. 270° C. It is employed in the manufacture of perfumes and in the preparation of the German *Maitrank* ('May drink').

Council. See **Councils**, **Ecclesiastical**; **Privy Council**.

Council Bluffs, city, Iowa, county seat of Pottawattamie co., on the Missouri River. It has manufactures of agricultural implements, flour and grain, passenger and freight elevators, railroad car wheels, artificial ice, paper, and machinery; p. 41, 439.

Council of Five Hundred, The, was instituted by Clisthenes at Athens, when he created ten new tribes in order to destroy the local influence of dominant families. It consisted of fifty members from each tribe, and superseded an older Boulé or Council of Four Hundred. The name is applied also to a part of the system of government in France from October 1795 to November 1799, known as the Directory. See **FRANCE: History**.

Council of Ten, The, was founded at Venice in the 14th century, and was an

important element in the Venetian constitution. It acted as a committee of public safety, and also had departments of finance and war. See *VENICE: History*.

Council of War, a conference of military or naval officers, who consider a plan of campaign, determine the order of battle, or give their opinions on some matter in which the commander wishes to fortify his judgment by an appeal to others.

• **Councils, County**. See **Local Government**.

Councils, Ecclesiastical, or Synods, were early held for the regulation and determination of questions of doctrine and discipline. Some were assembled for a single diocese, or province, or nation; but the ecumenical councils soon overshadowed all others. At these the whole of Christendom was assembled, and their decisions on matters of faith and discipline were binding on all Christians. The right of voting was confined from the fourth century to bishops, although the lower clergy and laymen might be present at deliberations.

The councils recognized by the Roman Catholic Church are: (1) 1st Nicæa, 325; (2) 1st Constantinople, 381; (3) Ephesus, 431; (4) Chalcedon, 451; (5) 2nd Constantinople, 553; (6) 3rd Constantinople, 680; (7) 2nd Nicæa, 787; (8) 4th Constantinople, 869; (9) 1st Lateran, 1123; (10) 2nd Lateran, 1139; (11) 3rd Lateran, 1179; (12) 4th Lateran, 1215; (13) 1st Lyons, 1245; (14) 2d Lyons, 1274; (15) Vienne, 1311; (16) Constance, 1414-18; (17) Basel, 1431-8; (18) Ferrara-Florence, 1438-42; (19) 5th Lateran, 1512-17; (20) Trent, 1545-63; (21) Vatican, 1869-70. Of these councils the Protestant churches generally recognize the first four; the Church of England, however, virtually the first five. The Greek Church accepts the first seven only. The Gallican Church has always wished to recognize the Council of Constance in its entirety, but orthodox Roman Catholics admit only such of its decrees as were approved by Pope Martin v.; and of the Council of Basel it is similarly declared that its decrees are to be accepted only to the end of its twenty-fifth session, and then only so far as ratified by Pope Eugenius iv. The Council of Ferrara was really a continuation of the Council of Basel, and Hefele (the historian of the councils) reckons twenty councils only. The fullest history is Hefele's *Conciliengeschichte*, continued by Hergenröther (9 vols.; new ed. 1894); partly trans.

as *A History of Christian Councils* (5 vols. 1871-96).

Counsel. A lawyer called in by other lawyers to give advice on a case is said to be 'of counsel.' See also **COUNSELLOR** and **ATTORNEY**.

Counsellor, a counselling lawyer or attorney-at-law. It is usual in the United States to call lawyers attorneys and counsellors; some states use the one title counsellor, others use both titles. A counsellor is properly one giving advice, especially legal advice. See **ATTORNEY**.

Count, a title derived from the Latin *comes*, and corresponding to the French *comte* and Italian *conte*. In some of its applications it is (or was) analogous to the English title *earl* and the German *graf*, with its cognates. Under the Roman empire the *comites* were originally simply attendants on magistrates, etc. The Emperor Constantine first gave the title a special dignity; but it soon came to be used almost indiscriminately among the imperial officers. In France, the counts, becoming rulers of provinces, made the title hereditary, and in many cases acquired practically sovereign power in their districts. Since the revolution, however, the title has only been honorary. The continental custom of conferring the title upon all sons of counts has caused the number of persons who bear the title to become very large, and in consequence detracts somewhat from its dignity. The title has never been adopted in the English peerage, though countess is the title borne by the wife of an earl.

Counterfeiting. The criminal offense of falsely and fraudulently making an article to simulate another, with the intent to induce its acceptance and use for the genuine one. The term most frequently refers to the illegal coinage of money.

Counter-irritants, in medicine, a class of remedies used for external application, which are intended to relieve congestion or pain in one part of the body by setting up irritation in another.

Counterpoint, in music, originated at the period when a system of signs called 'points' was used for notation. Counterpoint consisted of two or more lines of points, each line representing a melody, which, when set against each other and sounded simultaneously, produced correct harmony. When more than two melodies are employed—any number may be used—any one part may become a bass to the other, but the only interval of transposition is that of the octave. 'Strict' is

the term applied to counterpoint written with rigid adherence to its rules; but in modern composition considerable modification of rule is allowed. See *Counterpoint*, by E. Prout, 1890.

Counterscarp, in fortification, the exterior slope of the ditch towards the field, in contradistinction to the slope next the rampart, named the scarp or escarp.

Countersign. A watchword used in the army as a guard against passing the lines of sentinels by unauthorized persons, such as strangers, spies, or parties of the enemy endeavoring to effect a surprise. See also *PAROLE*.

Counter-tenor, the highest adult male voice, usually called a male alto.

County, originally the district ruled by a *count*. In the United States the county is an administrative division of a state. See *LOCAL GOVERNMENT*.

County Council. Under the local Government Act of 1888 county councils were established in all the counties of England and Wales. Under the act a county council consists of councillors, aldermen, and a chairman. Special powers are given to the London County Council, which succeeded to the duties and liabilities of the Metropolitan Board of Works. The control of the police they exercise only jointly with the justices of the quarter sessions. In the United States county councils were created in the State of Indiana by act of 1899. These councils consist of seven members, three chosen at large and four chosen by districts. Most of the financial powers of the county are exercised by the councils, the executive powers being retained by the board of commissioners.

County Courts. In England these courts, though founded in the days of King Alfred, were reconstituted in 1847 for the trial of civil cases of small importance, and are at present governed by the County Courts Act, 1888. They have really no connection with the old county courts, which are practically obsolete. In most of the American states county courts have criminal and civil jurisdiction within county limits. There are also probate courts for each county. The judges are elective.

Coup d'Etat, an arbitrary stroke of policy carried out by violent means. The most famous examples in history are the *coup d'état* of Napoleon Bonaparte, who in 1799 put an end to the Directory by his 'whiff of grape-shot'; and that of Louis Napoleon, who in

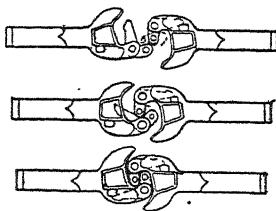
1851 broke up the National Assembly by force.

Couper, William (1853-1942), American sculptor; born in Norfolk, Va. He has executed numerous ideal works and portrait statues, busts, and bas-reliefs, among which may be mentioned *The Recording Angel* (Norfolk, Va.); *Angel of the Resurrection* (Chicago, Ill.); *Peace* (Vicksburg, Miss.); *Sailors' Memorial* (Annapolis, Md.); statues and portrait busts of Longfellow, Agassiz, Audubon, Charles Darwin, Peary, and many other men of note.

Couperus, Louis (1863-1923), Dutch novelist, born at The Hague of Scottish ancestry. After publishing a volume or two of poetry, he wrote his first novel *Eline Vere*, a psychological study of fashionable Dutch life, which appeared in 1889 and established the author's literary reputation. Most of his works have been translated into English by Alexander Teixeira de Mattos. These include *The Comedians*; *Old People and the Things That Pass*.

Couple, in dynamics, the name given by the mathematician Poinsoit in 1804 to a pair of equal parallel forces which act in opposite directions. The perpendicular common to the two forces is called the 'arm' of the couple, and the product of the arm and either force the 'moment.' The moment is the real measure of the couple.

Couplet, two lines of poetry, generally but not necessarily of the same length, which rhyme together. The heroic couplet, consisting of iambic pentameter verse, was much used by Pope and Dryden, and by other writers of that era.



Automatic Coupler.

Coupling, a contrivance for fastening railway cars together so that they may be readily connected or disconnected. In the United States the automatic coupling is almost universally adopted both for freight and passenger trains. With this system the car has at each end a spring bar, which is at once

coupling and buffer. Attached to the end of the bar is a pivoted hook. When the cars meet and the couplings are pushed together, the two hooks engage—their rear ends being at the same time secured by a locking-pin.

Coupon, the interest certificate on certain bonds or shares, to be cut off and presented for payment as it becomes due. Each coupon has printed upon it the date upon which it will be paid and the amount, and may be sold or deposited in a bank for collection. It furnishes a convenient form of agreement for each interest payment and is negotiable.

Courant, the heraldic term for running.

Courbet, Gustave (1819-77), French painter, was born in Ornans of peasant stock. He studied in Paris but was mainly self-taught. In 1871 he joined the Commune and was one of the leaders in the destruction of the Vendôme Column, for which he was fined and imprisoned. His hunting scenes and animal subjects are especially spirited and vigorous. Among his best known works are *Burial at Ornans*, *The Stonebreaker*, *Woman with a Parrot*, *The Quarry*, *Young Women of the Seine*, and *Doe Run Down in the Snow*. Consult Brownell's *French Art*; Van Dyke's *Modern French Master*.

Courcelles, town, province of Hainault, Belgium. It is a great coal-mining center; p. 17,000.

Courcelles, Daniel de Rémy, Sieur de, French governor of Canada, inaugurated his rule by leading an unsuccessful expedition against the Mohawks. A second expedition, in company with Tracy, was successful, and the five forts of the Mohawks were destroyed. This invasion of British territory called forth a protest from the authorities at New York, but without result.

Courier de Mère, Paul Louis (1772-1825), French writer, was born in Paris. Entering the army in 1792, he served in Italy. He acquired celebrity as the author of several powerful political pamphlets, and as the opponent of the Restoration government. His writings are valuable for representation of contemporary facts and events in French history.

Courlan, one of several names given to *Aramus scolopaceus*, a long-legged bird found in marshy places in tropical South America. In its general characteristics the bird is intermediate between the rails and the cranes. An allied species occurs in Central America and Florida, and is called the limpkin (*A. pictus*). It walks quickly, limping and jerk-

ing the tail. The cry is a melancholy wail varied by a clucking note.

Coursing, the pursuit of game by dogs which are guided by their eyes only. Formerly, various animals were coursed; but the sport is now chiefly restricted to the hunting of hares with greyhounds, the quarry being run to earth by sight only. The first known set of English rules for coursing was drawn up in the reign of Elizabeth, by the Duke of Norfolk. In 1858 coursing was placed on a really business-like footing by the formation of the National Coursing Club. The sport has taken root in America, chiefly in California and other Western States.

Court, a tribunal for the public administration of justice. Courts for the punishment of offences against the peace and dignity of the state and for the settlement of controversies among individuals are a necessary part of the machinery of government in every organized society. As commonly organized a court is composed of one or more judges, a clerk, and a marshal or similar officer for the preservation of order. The counsel or advocates in attendance and, in a proper case, a jury constitute part of the tribunal.

The administration of justice is a public function in England and the United States, and any proper person, whether connected with the business of the court or not, is entitled to attend and witness the proceedings. Another important feature of the English and American judicial system is the fact that the courts do not go out of their way to do justice or enforce the law of the land. They have no inquisitorial functions, nor do they, unless required by statute so to do, give opinions on abstract questions of law, but content themselves with the decision of actual controversies brought before them for determination. Courts are variously classified according to the scope and character of the jurisdiction which they are authorized to exercise. Some courts are restricted to a jurisdiction of a special character as magistrates' or police courts, and courts of general and special sessions, which have only a criminal jurisdiction, and the chancery tribunals, which exercise only an equity jurisdiction. Others, again like municipal and county courts, are confined to litigations involving small amounts, or to causes originating within a limited territory.

The Federal system of the United States has resulted in the creation of two distinct and parallel systems of judicial administra-

tion—that of the United States courts, which administer the Federal law throughout the United States, and that of the several States within their respective boundaries. The Federal courts as at present constituted fall into three classes: the Supreme Court, which see, the Circuit Courts of Appeals, and the District Courts. Under Act of March 3, 1911, there is constituted a Circuit Court of Appeals in each of the nine judicial circuits of the United States. Each of these has three circuit judges and to each is assigned one of the justices of the Supreme Court. Cases are brought to the Circuit Courts of Appeals from the District Courts, and in some cases a further appeal may be taken to the Supreme Court.

The District Courts are the lowest class of Federal tribunal. There are 88 (exclusive of those in non-contiguous possessions), for each one of which a district judge, a clerk, marshal and district attorney are appointed. In addition to these courts there are also a *Court of Claims*, established in 1885, for the purpose of dealing with the claims of private persons against the Government of the United States, and a *Court of Customs Appeals* created by the Tariff Act of 1909 to decide questions relating to customs duties. There is great diversity in the judicial organization of the several States, but the main outlines of the system are everywhere the same. In every State there are three sets of courts: a Supreme court or court of appeal, superior courts of record, and local courts. The Supreme Court is at the head of each State judicial system. The jurisdiction of the State courts, both civil and criminal, is unlimited except in certain cases in which some point of Federal law arises. In certain cases State courts have a concurrent jurisdiction with Federal courts. Within the last fifty years most of the States have made great changes in their judicial systems and have revised and codified their statutes. In some States the judges are elected by the legislature, in others they are appointed by the Governor, and in the remaining ones they are elected by the people. Their term of office varies from two to twenty-one years, with eight to ten years as the average.

There is more similarity in the inferior courts in the several States than in the higher courts. Perhaps the most important of these, apart from certain municipal courts in the larger cities, are the County Courts, which usually exercise an important jurisdiction, both civil and criminal (but not gen-

erally equitable), within their respective counties. Concurrent with these are the Surrogates' or Probate Courts, and below them are the justices' courts of cities and villages, the courts of rural justices of the peace, the police courts, and the like, which are too various to be described. All of these are knit together by a system of appeals, whereby the action of inferior magistrates is in the last analysis controlled by the higher tribunals.

Prior to 1873 the English judicial system was one of great complexity, the result of a thousand years and more of natural evolution. The superior courts comprised the three great common law tribunals—the Court of King's Bench, the Court of Common Pleas, and the Court of Exchequer. The judicature act of 1873, which reformed the entire judicial system of England, consolidated all of these courts into one Supreme Court of Judicature. See COURT OF CLAIMS; COURTS, MILITARY; SUPREME COURT; JURISDICTION;

Court, Contempt of. See **Contempt of Court.**

Court, Presentation at, a ceremonial function at which the subject is formally presented to his sovereign or representative. This ceremony confers on its recipient so much prestige that it is carefully safeguarded and the credentials of those aspiring to the honor are closely investigated. At the British court the names of those desiring to be presented are sent to the office of the Lord Chamberlain, who in turn submits them to the sovereign. Their various rights and privileges and their precedence are then determined, and they are required to rehearse the ceremony under personal direction of the Lord Chamberlain. Full court dress is worn at the ceremony. Subjects of foreign countries may be presented by their own ambassador.

Court Baron. See **Barony.**

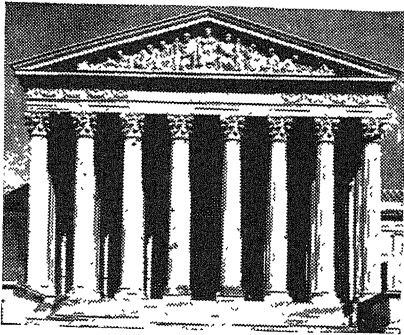
Courtenay, Edward Henry (1803-53), American educator, was born in Baltimore, Md. He was graduated at West Point, and there served as professor of physics and philosophy. He was professor of mathematics at the University of Pennsylvania from 1834 to 1836, was occupied with civil engineering work for the government from 1837 to 1842, and became professor of mathematics at the University of Virginia.

Court Fool. See **Jester.**

Courthope, William John (1842-1917), English man of letters. His lectures on Eng-

lish poetry, published in 1901 as *Life in Poetry and Law in Taste*, constitute a valuable exposition of the art. He published *The Three Hundredth Anniversary of Shakespeare's Birth* (1864); *The Liberal Movement in English Literature* (1885); *History of English Poetry* (6 vols. 1895-1909). He wrote a life of Pope, and edited a standard edition of the poet's works.

Court Leet, an English criminal court of original jurisdiction. In early English law manorial lords held certain jurisdictional privileges among which was the 'view of frank-pledge,' which carried with it certain police rights. At that period there seems to have been no distinction between court leet and court baron. Under Edward I. a distinction was drawn, the court leet exercising through the authority of the crown and the court baron exercising only upon manorial questions. The court leet was a court of record, sitting with a jury and a steward, who presided as judge. These courts remained until the middle of the 19th century as active criminal courts but now their existence is for only formal and ceremonial purposes.



New Supreme Court Building, Washington.

Court Martial, a military court for the trial of offenders against military law. The court martial is based on that part of the U. S. Constitution which empowers Congress to set up rules and regulations for the military forces with specific exemption from civil courts for offenses against the military forces in time of war or public danger. There are general courts martial, consisting of five or more officers, empowered to hear any kind of case and impose any penalty, including the death penalty; special courts martial of three or more officers, with power to judge cases in which the maximum penalty would

not exceed six months imprisonment or the forfeiture of 2/3 pay for the same period; and summary courts martial of one officer, who may not inflict imprisonment for more than one month or forfeiture of pay for a similar period. Without a court martial officers may not inflict confinement or forfeiture of pay as punishments, nor may they impose extra duties or withhold privileges for more than seven days. As to persons, courts martial have jurisdiction over all persons in the military pay and service of the United States, including camp retainers in war time, in any and all places, military offenses not being territorial.

Courtney, Rt. Hon. Leonard Henry (1832-1918), English public official, born in Penzance, Cornwall. He was professor of political economy at University College, London (1872-5), undersecretary of state for the Home Department (1880-1), and undersecretary for the Colonies (1881-2). As a member of Parliament, 1876-1900, he was a strong Liberal-Unionist, and opposed his party on the Transvaal war question.

Courtney, William Leonard (1850-1928), English journalist and author. He succeeded Frank Harris as editor of the *Fortnightly Review* (1894), and published the *Life of John Stuart Mill* (1889), *Studies at Leisure* (1893), *The Development of Maeterlinck* (1904), *The Literary Man's Bible* (1907); *The Soul of a Suffragette* (1913).

Court of Claims, a court instituted to hear and determine claims against the state, whether asserted by a citizen or by a foreign state or a subject thereof. A sovereign state cannot be prosecuted in the tribunals created by it except by its own consent. The U. S. Court of Claims was instituted by act of Congress in 1855. It consisted originally of three judges, but is now made up of a chief justice and four associate justices. It is empowered to hear and determine all claims founded on any act of Congress, or on any regulation of an executive department, or on any contract, express or implied, with the U. S. government, and all claims which may be referred to it by either house of Congress. Similar courts with like jurisdiction have been created in most of the States.

Court of Common Pleas, one of the tribunals of common law in England.

Court of Session, the highest civil tribunal in Scotland.

Courtois, Jacques (1621-76), French painter of battle scenes. Five of his cavalry pictures are in the Louvre.

Courtrai, tn., prov. W. Flanders, Belgium, is famous for its linen, its lace (which employs from 5,000 to 6,000 women), and its linen-bleacheries, for which the water of the Lys is especially suited. Outside its walls, in 1302, was fought the 'Battle of the Spurs,' between the weavers of Bruges, Ypres, and other Flemish towns, and the chivalry of France, the latter being disastrously routed.

Courts, Military. Military tribunals, in the U. S. Army, are classified as Courts-martial, Courts of Inquiry, and Military Commissions. Of courts-martial there are four.—(1) general, (2) garrison, (3) regimental, and (4) summary courts-martial—which are all intended to try offenders against military law. Of these the summary court is the one most used as a means of discipline and has almost superseded all other inferior courts. Courts of Inquiry are for the examination of transactions of officers and soldiers, or of imputations or accusations against them. Military Commissions are for the trial of offenders against the laws of war and under martial law founded on necessity. Officers charged with crime are arrested and confined to their quarters by their commanding officers while awaiting trial, and must be served with a copy of the charges against them within eight days of the time of arrest, and brought to trial within ten days thereafter, unless the necessities of the service clearly prevent. Non-commissioned officers against whom charges are preferred are placed in arrest in barracks, and are not to be confined in the guard-house with privates, unless in aggravated cases where escape is feared. Private soldiers under charges for a minor offence are placed in arrest in quarters, but those to be tried by a general court-martial for more serious offences are confined in the guard-house, being kept separate, however, from soldiers serving sentences, and not being sent out to work with them. No soldier may be confined without the order of an officer, except for serious disorderly conduct. Courts-martial in the U. S. Army are composed of commissioned officers only, and all officers on the active list are available for this duty. Officers of the regular army and the marine corps may be associated together for trial of members of either of these branches of the service, and the same is true of the regular and volunteer forces; but with these two exceptions regular officers are not competent to sit on courts for trial of offenders belonging to other forces.

Courts-martial derive their existence from

acts of Congress. Their jurisdiction is limited to the purpose of maintaining military discipline, and their decisions, within this jurisdiction, are not reviewable by any courts whatsoever. As to persons, courts-martial have jurisdiction over all persons in the military pay and service of the U. S., including camp retainers in war time, in any and all places, military offences not being territorial. Officers, cadets, and candidates for commission are tried by general courts-martial only.

A military charge corresponds to a civil indictment, and is supported by specifications which set forth the facts constituting the offence. A charge having been preferred, the commanding officer investigates the case, endorses his recommendation thereon, and forwards it to the authority competent to order a general court-martial. The court having been duly ordered, assembles in dress uniform, with swords, at the place and time specified in the order. The members take seats in the order of rank—the president (the senior officer present) at the head of the table, and the judge advocate, named as such in the order, at the foot of the table. Courts of Inquiry may be ordered only upon the demand of an officer or soldier whose conduct is to be investigated by the President or any commanding officer. It does not give opinions, except when specially ordered to do so, but simply states the facts disclosed by its investigations into the accusations against the officer or soldier demanding the inquiry, and its conclusions.

Consult *U. S. Army Regulations, Manual for Courts-martial*. See MILITARY LAW.

Cousin, Jean (?1501-89), early French painter, celebrated also as a worker in stained glass, a sculptor, and an author. The best of his surviving pictures is *The Last Judgment* (Louvre)—fine and thoughtful; *Eva Prima Pandora* (mentioned in his book, *Entrée à Paris*). His miniatures show dignity and simplicity.

Cousin, Victor (1792-1867), French writer and philosopher. Having lost faith in the philosophic systems of Locke and Condillac, he adopted the principles of the Scottish metaphysicians Reid and Dugald Stewart, and during a visit to Germany (1817-19) studied the systems of Kant, Schelling, Hegel, Jacobi, and Fichte. At this time Cousin was elected a member of the French Academy. In Guizot's ministry he became a member of the Council of Public Instruction, afterwards director of the Ecole Normale, and was created a peer of France.

(1832). Intimate personal knowledge of the condition of public education throughout Europe enabled him to formulate a successful scheme of primary instruction while minister of public instruction under Thiers (1840). Beside his own many philosophical works, he also published editions of Abélard and Blaise Pascal, and critical works on Aristotle, Locke, and Kant. He founded no philosophical system of his own, but is regarded as the prophet of eclecticism.

Cousin-Montauban, Charles Guillaume Marie Apollinaire Antoine, Comte de Palikao (1796-1878), French general, born at Paris. From 1831-57 he served in Algiers. When war broke out in China (1860), he commanded the combined forces of the French and British, and in less than three months took Peking. Appointed premier and minister of war (Aug. 9, 1870), he held office for only 24 days; but in that short time he armed, fortified, and provisioned Paris, and raised a force of 140,000 men, whom he posted at Châlons.

Couthon, Georges (1756-94), French politician. He adopted the ideas of the revolution, and was elected in 1791 to the National Assembly. Upon being re-elected to the Convention he attached himself to Robespierre. In December, 1793, he became president of the Convention, but soon after was guillotined with Robespierre, Saint-Just, and others.

Couvade, a term in use among anthropologists to denote the curious custom of 'man-childbed' practised by many ancient and some modern races. This remarkable custom consists in the father of a new-born child affecting to undergo all the physical pains of maternity, being carefully nursed and waited upon by friends, while the mother herself returns to her work in the fields shortly after the birth.

Covenant. In law, the general term 'contract' comprises in the language of law every description of agreement, obligation, or legal tie whereby one party binds himself or becomes bound expressly or implicitly to another to pay a sum of money, or to do or refrain from doing any particular act. The word plays a great part in the Bible, not only from the frequent occurrence of pacts among human beings, but principally from its application to the relation between Yahweh and His people Israel.

Covenant, Ark of the. See **Ark of the Covenant**.

Covenanters, the name by which the sub-

scribers of the covenants, mentioned in the succeeding article, came to be known, especially in the persecuting times after the restoration of 1660. In 1662 the covenants were declared to be unlawful; in 1682 they were formally repudiated; and in 1685 adherence to them was declared to be treason. While many were but too eager to follow the royal example in renouncing them, a large party in Scotland clung heroically to their vows, and a dismal and cruel struggle ensued. See **SCOTLAND, CAMERONIANS**; *Gilfillan's Martyrs, Heroes and Bards of the Scottish Covenant* (1852); and *Brown's Covenanters of the Merse* (1893).

Covenants. The Scottish covenants were bonds of agreement, the signatories of which pledged themselves to maintain the reformed religion against Romanism or (what seemed to them little better) Episcopacy. A covenant was signed at Edinburgh in 1557—its object being the furtherance of Protestant principles in the face of actual and possible opposition from Rome. The distinctively Scottish covenant, however, is that known as the National Covenant, signed by the king and the royal household in 1580, and by people of all ranks in 1581. The principal points in the National Covenant were the renunciation of Popery; adherence to the true religion, and to the Presbyterian form of it; and loyalty to the throne. In 1643 the Scottish Estates and the General Assembly consented to join the English Parliament in a union for the better guarding of civil and religious liberty, and the outcome was the Solemn League and Covenant, the chief objects of which were the preservation of the reformed religion in Scotland, England, and Ireland, the securing of religious uniformity, and the defense of parliamentary privileges and of the king's person. This was accepted by the English Parliament, and by the Westminster Assembly, then sitting. These covenants will usually be found in editions of the Westminster Confession of Faith.

Covent Garden, a square in London, England, between Long Acre and the Strand. The name is a corruption of Convent Garden, the district having formerly been the site of a convent garden belonging to Westminster Abbey. It was laid out by Inigo Jones in 1632, and soon after that became a fashionable residential quarter. It is now famous for its vegetable, fruit, and flower market, having been used as such since the 17th century. See **LONDON**.

Covent Garden Theater, founded by

John Rich, opened Dec. 7, 1732, Quin being leading actor. In June, 1746, Garrick played for six consecutive nights, and in 1747 joined Rich for the season. From the outset Covent Garden and Drury Lane were bitter rivals. In 1740, Peg Woffington made her *début* as Sylvia in the *Recruiting Officer*, and it was at this theater that she died while playing Rosalind. In 1773 Goldsmith's *She Stoops to Conquer* was produced. In 1803 John Kemble became proprietor of one-sixth of the patent. On Sept. 30, 1808, the house was destroyed by fire; but within eight months Kemble rebuilt it. In 1812 Mrs. Siddons took leave of the stage as Lady Macbeth. In 1816 Macready here made his London *début*. In 1888 Augustus Harris took up the management. After Harris's death the house passed into the hands of a company.

Coventry. (1.) City, Warwickshire, England; on London and North Western R. R., 10 m. n.e. of Warwick. The church of St. Michael (1373), and Christ Church, with a spire dating from the 14th century, are of interest. A 16th-century tapestry is one of the treasures in St. Mary's Hall. Bablake's and Ford's hospitals contain beautiful 16th-century wood carvings. Woolen goods were made from 1436 to the end of the 17th century. Calico-weaving continued from 1770 to the beginning of the 19th century. The manufacture of silk, piece goods, and ribbons was established early in the 18th century. Watch-making, the manufacture of sewing-machines, bicycles, pneumatic tires, and motor cars, have now become of prime importance, though printing and iron-founding are also carried on. The great show-fair, formerly held for 8 days, is now limited to 5. It was instituted about 1217, and the pageant of Lady Godiva and Peeping Tom, introduced in 1678, is now held only occasionally. In 1940 the city was almost completely destroyed in a one-night German air bombardment but is being rebuilt. Henry IV. held his Laymen's Parliament here. (2.) Tn., Kent co., R. I. Cotton manufacturing is the chief industry. It was incorporated in 1741 and was the home of Gen. Nathanael Greene; p. 6,420.

Coverdale, Miles (1488-1568), English bishop and translator of the Bible, was born in Coverdale, Yorkshire. He studied philosophy and theology at Cambridge, took orders at Norwich in 1514, and entered the Augustinian monastery at Cambridge. He went abroad and in 1535 issued the first complete English translation of the Bible, probably at

Zurich. In 1538 with the permission of Henry VIII and Francis I. he went to Paris to superintend a second edition of the Scriptures in English, but before its publication an edict was issued suppressing it and consigning the entire edition of 2,500 copies to the flames. Some few copies, however, were saved from destruction and carried to London and in 1539 the *Great Bible* or *Cromwell's Bible* was produced under Coverdale's direction. From 1540 to 1548 Coverdale lived in exile on the continent, teaching and preaching for his livelihood. Upon his return to England, he was appointed chaplain to Edward VI., and later became bishop of Exeter (1551). While in Geneva, he is said to have assisted in the preparation of the celebrated *Geneva Bible*. Coverdale's writings and letters were edited for the Parker Society by the Rev. G. Pearson (2 vols., 1844-6). Consult also *The English Bible*, by Christopher Anderson; *The Bible by Coverdale* by F. Fry; Hoare's *The Evolution of the English Bible*.

Coville, Frederick Vernon (1867-1937), American botanist. In 1888 he was appointed assistant botanist in the U. S. Department of Agriculture, and, in 1893, chief botanist in the same department and curator of the U. S. National Herbarium. The results of a botanical expedition to the famous Death Valley in 1890-1 are set down in his *Botany of the Death Valley Expedition* (1893).

Covington, city, Kentucky, county seat of Kenton co., on the Ohio River. A fine suspension bridge, the first constructed in the United States, crosses the Ohio to Cincinnati, and there is a bridge across the Licking to Newport. The city has a Roman Catholic cathedral, with which are connected a priory, academy, convent, foundling asylum and hospital. Pork packing is an important industry and there are manufactures of furniture, stoves, tinware, flour, leather, glass, tobacco, pottery, and bricks; p. 62,018.

Covington, town, Louisiana, county seat of St. Tammany Parish; the center of a fruitful stock gardening district; p. 3,820.

Covington, town, Tennessee, county seat of Tipton co. Cotton cloth, sheetings, chevots, cotton seed oil, are manufactured; p. 3,410.

Coward, Noel (1899-), English playwright, actor, director, composer, was born in Teddington. He wrote *Cavalcade*, *This Year of Grace*, *Private Lives*, *Design for Living*, *Tonight at 8:30*, *Blythe Spirit*.

Cowbird, any of several species of gregar-

ious passerine birds belonging to the genus *Molothrus*, found in almost all parts of North America. These birds are remarkable for their parasitic habits, for, like the European cuckoo, they make no nests of their own but place their eggs in the nests of other birds for incubation. The most familiar species, *M. ater*, is among the more numerous of the birds of the Eastern United States and Canada. In small flocks, it haunts fields and pastures, feeding upon insects stirred up by the cattle, a habit from which it derives its name. The females lay one pepper-and-salt-spotted egg in the nest of any bird which may be accessible. When this is hatched, the young cowbird throws out the other eggs or young, and usurps the attentions of the foster parents.

Cowen, Sir Frederic Hymen (1852-1935), English musical composer and conductor, was born in Jamaica and held various important appointments as conductor—Melbourne Centennial Exhibition, London Philharmonic Society, Liverpool Philharmonic Society, Handel Triennial Festival, Cardiff Festival, and the Scottish Orchestra. He was a prolific and versatile composer, his works including symphonies, oratorios, operas, cantatas, overtures, and pianoforte pieces, as well as settings of about three hundred songs. His chief works are the cantata *Rose Maiden* (1870); *Scandinavian Symphony* (1880); *Ruth*, an oratorio (1887); *The Veil*, an oratorio (1910).

Cowes, seaport and summer resort on the n. shore of the Isle of Wight, Hampshire, England; here, on the Medina river is Cowes Castle, built by Henry VIII., once used as a state prison, but occupied since 1856 as the headquarters of the Royal Yacht Squadron. The annual regatta held in August is famous as 'Cowes Week.' Cowes has important shipbuilding and munition works. It was heavily bombed in World War II; p. 14,634.

Cowl, Jane (1884-), actress, was born at Boston, Mass. She attended Columbia U. 1904-06, and married A. E. Klauber, of N. Y. City in 1908. She appeared in small parts with David Belasco Co., and made her debut in *Is Matrimony a Failure*, 1909. She has starred in many plays since that time, including, *Within the Law*; *Common Clay*; *Smilin' Through*; *Romeo and Juliet*; *Antony and Cleopatra*; *The Road to Rome*. She was co-author with Jane Murfin of *Daybreak*; *Information, Please*; *Lilac Time*, and played in last two throughout the U. S.

Cowley, Abraham (1618-67), English

poet. In 1656 he brought out a collected edition of his poems, consisting of *Miscellanies*. He represents the transition from Jacobean to Restoration poetry. His *Pindarics*, his most successful work, set the fashion to Dryden's *Odes* and *The Pindarics* of the 18th century. Consult his biography by Dr. Johnson.

Cow Lily (*Nymphaea advena*). See *Nymphaea*.

Cow Parsnip, or **Hogweed**, (*Heracleum Spondylium*), a tall-growing umbelliferous plant with a flat fruit. Its succulent stems furnish a grateful green food, or salad, for Indians and voyageurs, in Canada, in the earliest spring.

Cowpens, vil., Spartanburg co., S. Carolina. Here on Jan. 17, 1781, Gen. Morgan with an American force of about 1,100, defeated Col. Banastre Tarleton with an approximately equal force, the battle being, on the American side, one of the best planned during the Revolutionary War; p. 1,343.

Cowper, William (1731-1800), English poet. He was educated at Westminster School, with Churchill, the poet, and Warren Hastings. In 1763 he was named clerk of the journal of the House of Lords, but to qualify for this he had to appear publicly in the Lords, and to submit to scrutiny. From this he shrank with a horror which drove him to attempt suicide, and he became for a time insane. He was put under the control of Dr. Cotton of St. Albans, but in 1765 went to Huntingdon, where the gentle recluse attracted notice of the Unwins (father, mother, son, and daughter). Cowper was induced to quit his lodging and dwell with this household. From this on his association with Mrs. Unwin was a steadying influence in a troubled life threatened always with periodic attacks of depression and insanity. During a period of association with John Newton, a curate, he wrote hymns, of which he left sixty-eight. From 1782 dates Cowper's literary fame. The quiet humor which so pathetically stood between him and despair was strangely combined with the earnestness of the Hebrew prophet in the volume which included *Table-Talk*, *The Progress of Error* (1782), *Truth*, *Expostulation*, *Hope*, *Charity*, *Retirement*, in all rhymed heroics. He next versified (1782) the story of John Gilpin, heard from Lady Austen, who also encouraged Cowper to write blank verse, the result being the discursive *Task* (1785). Before its completion that friendship which was coextensive with so much of his best literary effort came to an end. In his translation of

Homer (published 1791) he was the pioneer in the many attempts to render the *Iliad* and *Odyssey* in blank verse. See *Lives* by Southey (1836). Goldwin Smith (English Men of Letters, 1880); *Works* and *Letters* in editions by Southey (1836)

Cowper, William (c. 1664-1723), English statesman, commissioner for the treaty of union between England and Scotland, he took a leading share in the negotiations between the two countries. Becoming first Lord Chancellor of Great Britain in 1707, on the fall (September, 1710) of the Whig ministry he resigned his office, which, however, was restored to him by George I. In 1718 he again resigned his office. As an orator he was possessed of considerable power.

Cowper, William (1666-1709), English surgeon, published a treatise on the muscles, and *The Anatomy of the Human Body* (1698). He was also the discoverer of 'Cowper's glands.'

Cowper's Glands, two small bodies situated immediately below the membranous urethra in the male, and behind the bulb.

Cowry, or **Cowrie** (*Cypræa*), the name of a genus of gasteropod mollusks, including a number of species inhabiting the warmer oceans. Many species are of great beauty, the shells, protected in life by upturned flaps of the mantle, being highly polished and richly colored.

Cowslip. The cowslip (*Primula officinalis*) is one of the plants most intimately associated with England, as is shown, among other things, by the popular names it bears—fairy cup, petty mullein, paigle, and several others. Cowslips have tufts of soft green, wrinkled foliage, and heads of small, pale yellow flowers. In a wild state they grow in meadows. The cowslip of early spring in eastern America is *Caltha palustris*, while the shooting-star (*Dodecatheon Meadia*) is called the American cowslip in the Middle States; *Mertensia Virginica* is known as the Virginian cowslip.

Cow-tree (*Galactodendron utile*) is a tall-growing urticaceous tree which occurs in Venezuela. It derives its popular name from the milky juice it exudes when an incision is made into the bark.

Cox, David (1783-1859), English landscape painter; from 1827 till 1841 resided in London, where he taught drawing in several schools; but from 1841 till his death lived at Harborne, near Birmingham. In his own lifetime Cox never got beyond £100 for his pictures; but in 1875 his *Hayfield* brought £2,-

950, the largest sum paid up to that date for a water color. His oil paintings date from 1839. Cox's favorite scenery was around Bettws-y-Coed. See Hall's *Biography* (1881); Redgrave's *Century of Painting* (1893).

Cox, Jacob Dolson (1838-1900), American soldier and statesman, was born, of American parentage, in Montreal, Canada. He was graduated (1851) from Oberlin Col-



Cowslip.

1, Flower (section).

lege, was admitted to the bar of Ohio in 1853. He fought through the Civil War with brilliancy. At its close he was elected governor of Ohio as a Republican (1866-7). He presided at the convention which nominated Grant for the presidency, and was Secretary of the Interior in Grant's cabinet (1869-70). He was U. S. representative, 1877-79. Among other military books he published *Military Reminiscences of the Civil War* (1900).

Cox, James Middleton (1870), American editor and public official. He became a reporter on the *Cincinnati Enquirer*; and in 1898 became owner and publisher of the *Dayton News*. In 1903 he bought the *Press Republic* of Springfield, Ohio, and changed its name to the *Daily News*. He was elected to Congress in 1908 and again in 1910. Two years later he was chosen governor of Ohio, was defeated for re-election in 1914, and was

again elected in 1916 and 1918. As Governor of Ohio he was known for his executive ability, and as a supporter of progressive legislation. At the Democratic National Convention in San Francisco in July, 1920, he was chosen candidate for President.

Cox, Kenyon, (1856-1919), American painter, son of Jacob D. Cox, was born in Warren, O. He devoted himself to mural painting. He was a member of the group which decorated the buildings of the Columbian Exposition, and his work is to be seen in the Library of Congress, the Minnesota State Capitol, and the Appellate Court of New York City. His writings include *Old Masters and New* (1905), a general view of painting since the 16th century; *Painters and Sculptors* (1907).

Cox, Palmer (1840-1924), Canadian-American artist and author. He wrote for San Francisco papers, then removed to New York in 1875, where he developed his idea of 'The Brownies,' little sprites in the costumes of all nations, whose experiences he described in verse and illustrated with his own drawings. *The Brownies, Their Book* (1887) was followed by six or seven other volumes giving their comic history. Mr. Cox also published a series of *Queer People* books (1888).

Cox, Samuel Sullivan (1824-89), known also, from one of his articles entitled *The Great Sunset*, as 'SUNSET' COX, American political leader, was born in Zanesville, O. He was graduated from Brown University in 1846 and in 1853-4 was editor, at Columbus, O., of the *Ohio Statesman*. He became representative in Congress from Ohio (1857-65) and from New York, representing the latter State almost continuously from 1869 until his death. A bill introduced by him and passed by Congress, raising the salaries of letter carriers and procuring them vacations with pay, led to the erection of a statue of him in New York by the letter carriers of the country. In 1885 he was U. S. minister to Turkey. He published *Three Decades of Federal Legislation, 1855-85* (1885).

Coxe, Arthur Cleveland (1818-96), American Protestant Episcopal prelate; was rector of Protestant Episcopal churches at Hartford, Conn., and Baltimore, Md., from 1842 to 1863. He became bishop of Western New York, 1865. In 1853 he took part in the movement which resulted in the revision of the prayer-book.

Coxe, Tench (1755-1824), American politician and political economist, was born in Philadelphia, Pa., and became a partner in

his father's counting-house at twenty-one. At the outbreak of the Revolution he became a Royalist, but on the departure of the British troops turned Whig. He was made purveyor of supplies by Jefferson in 1803, retiring in 1812. He performed very great services in promoting the cotton industry in the United States, and in the development of the country's economic system.

Coxe, William (1747-1828), English traveller and author. His early works relate to travel, particularly in Switzerland and in Russia and Scandinavia (1784). In 1807 appeared his valuable *History of the House of Austria*.

Coxswain, the steersman of a boat, and commander of the boat's crew.

Coxwell, Henry Tracy (1819-1900), English aeronaut, made his first ascent in 1844, and his last in 1885. In 1848 he conducted a series of experiments in military aërostatics in Germany and Austria; and in 1862, with James Glaisher, turned his attention to meteorological ballooning, reaching a record height of 7 m. He managed the war balloons for the Germans during the Franco-German War (1870). He founded (1845) and edited *The Balloon* and wrote *My Life and Ballooning Experiences* (2 vols. 1887-9).

Coyote, or Prairie Wolf, (*Canis latrans*), a small wolf, smaller than the gray wolf but very like it in general appearance. It varies in color at different seasons of the year, being a bright brown in summer and a yellowish gray in winter, both of which colors are overlaid with a shading of black. The fur is thick and long, and the tail, always carried low, is bushy. The animal ranges from the City of Mexico northward through the Great Plains and Rocky Mountains to Alberta, being very abundant in Texas and New Mexico. It is never dangerous to man. Its cry, which is characteristic and easily recognizable, is a sort of dog-like yelping, half-howl and half-bark.

Coysevox, Antoine (1640-1720), French sculptor. He decorated the interior of the palace of Versailles, and executed the tomb of Cardinal Mazarin; the statue of Condé and the monument of Colbert; busts of Le Brun, Fénelon, and Racine.

Cozens, John Robert (1752-99), English landscape painter in water colors, son of the painter Alexander Cozens (d. 1786). Previous to Turner, Cozens was the greatest of English painters in water colors.

C. P. A., chartered or certified public accountant.

Crab, a name applied generally to those of the decapod (ten-legged) Crustacea which have the tail short and inturned (brachyura); applied also to the hermit crabs and their allies, in which the tail is long. In the more typical forms, such as the blue or edible crab (*Callinectes sapidus*), the body is depressed, and the strong shield or carapace which covers it is expanded laterally. The lateral regions lodge the gills, here more efficiently protected than in lobster or prawn. The chelipeds, or great claws, are so curved that in repose they fit closely to the margin of the carapace; the other legs are inserted at a considerable distance apart, and are adapted to support the whole weight of the body. The abdomen, or tail is only slightly developed, has no tail fin, is kept permanently inturned, and has rudimentary appendages only. In accordance with the sedentary mode of life, the antennæ are short, instead of long as in the lobster, and the eyes are placed in sockets, into which they can be retracted.

Like other crustaceans, crabs periodically cast their chitinous and limy shells. The Blue Crab is found from Cape Cod to Florida and is taken for market in immense quantities, often immediately after moulting, before the new shell has hardened, when it is known as the 'soft-shelled crab.' The Fiddler Crab, found in great numbers on the Atlantic coast, is characterized by the excessive development of one claw, popularly likened to a fiddle. Crabs are generally scavengers, but the land species are also vegetarian in diet. They are very active, great fighters, and often wily in averting danger. From the time they leave the egg until they attain adult form they pass through several complete metamorphoses. Crabs move sideways instead of forward, often with great rapidity. They vary greatly in size and color, green, blue, and gray being the most common hues. They are of economic importance as a food in many parts of the world. Consult Mayer's *Seashore Life*; Arnold's *Sea-Beach at Ebb-Tide*.

Crab Apple, a term applied somewhat vaguely to any sour or uncultivated species of the apple family. The Siberian or True Crab Apple belongs to the species *Pyrus baccata* and is a native of Asia. The best known American species are *P. augustifolia*, a small tree growing to about 30 ft. in height and *P. coronaria*. Their fruits, hard and astringent, make excellent preserves, jellies, and marmalades, as well as high grade cider. The Asiatic species are often planted for their beauty of fruit and flower alone. *P. pulcherrima*, *P. halliana*, *P. spectabilis*, and *P. prunifolia* are favorite species.

Crabbe, George (1754-1832). English poet, was born in Aldeburgh, Suffolk, the son of a salt master. Longing for a literary career he resolved to go to London and try his luck. There he was befriended by Edmund Burke, who took him into his house, and secured a publisher for his poem, *The Library* (1781). His name was speedily made, and, having taken orders, he accepted the curacy at Aldeburgh, and soon after procured, through Burke, a chaplaincy to the Duke of Rutland at Belvoir Castle. After occupying various cures in Southern England he at length settled in Trowbridge, Wiltshire (1814), where he remained until his death. Among his publications are *The Village* (1783), *The Newspaper* (1785), *The Parish Register* (1807), *The Borough* (1810), *Tales* (1812), and *Tales of the Hall* (1819).

Crabbe is as much the poet of East Anglia as Scott of the Borderland or Wordsworth of the Lake Country. Consult *Life* by George Crabbe, his son; *Leadbeater Papers*; Leslie Stephen's *Hours in a Library*; Ainger's *Crabbe*, in 'English Men of Letters Series'; Huchon's *George Crabbe and His Times* (Eng. trans.).

Crab Grass, a popular name for *Panicum sanguinale*, a coarse annual grass common throughout the United States. The name is also applied to Eleusine.

Crab Plover, a peculiar bird (*Dromas ardeola*), so called from its habit of feeding chiefly on crabs. It inhabits the coasts of the Red Sea and Indian Ocean, usually in flocks.

Crab Spider, a species of spider belonging to the family Thomisidæ, so called from its broad, short body, the crab-like attitude of its legs, and its habit of walking sidewise. It spins no web and is found chiefly on plants and fences.

Crabtree, Charlotte ('Lotta') (1847-1924). American actress, was born in New York City. Her first great success was as Little Nell in Brougham's version of *Little Nell and the Marchioness*. Other favorite comedy parts were Topsy, Bob, Firefly, The Little Detective, Musette, Nitouche, and Sam Willoughby.

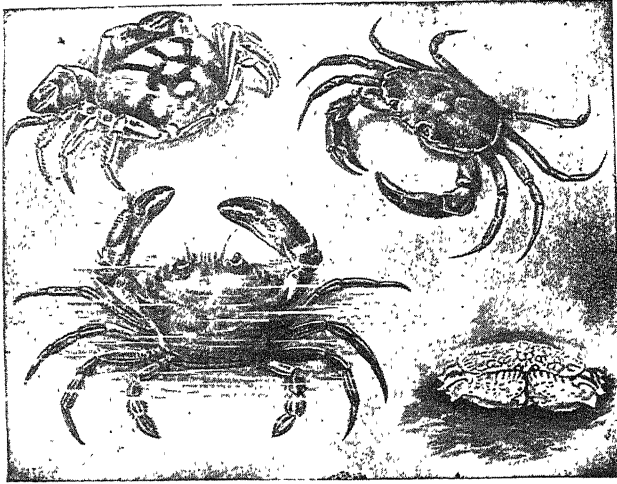
Cracked Heels, a condition in horses due to washing their legs and imperfectly drying them, or permitting the animals to stand in accumulated filth and exposed to drafts.

so that the skin becomes inflamed, tender, itchy, thickened, and by and by cracked

Cracker, or **Biscuit**, a small flat bread made dry and crisp by baking. The former name is the one commonly used in the United States, while the latter is employed in England and elsewhere. Crackers are made of flour, water or milk, and salt, with the addition of flavorings and other ingredients, such as sugar, nuts, raisins, spices, or fruits, as required. The manufacture of crackers is

the sun, which caused the glaze to craze or crackle. Red pigment or black Chinese ink was then rubbed into the cracks to accentuate them. Good imitations of crackle ware are now produced in various American potteries. The crackle ware of the Dedham Pottery, Dedham, Mass., was manufactured by a secret process. This ware is considered a true reproduction of the Chinese crackle and has won many awards when exhibited.

Cracovienne, a Polish national dance with



Crabs.

Upper Left, Land crab (*Gecarcinus ruricola*). Upper Right, Green shore crab (*Carcinus maenas*). Lower Left, European velvet crab (*Portunus puber*). Lower Right, *Calappa flaminea* (closed).

a large and important industry in the United States, dating from the latter part of the 18th century, but reaching large proportions only with the last quarter of the 19th century.

Crackers, a popular name for the poor mountain white population of the Southeastern States of the United States, particularly Georgia, probably in reference to their diet of cracked corn.

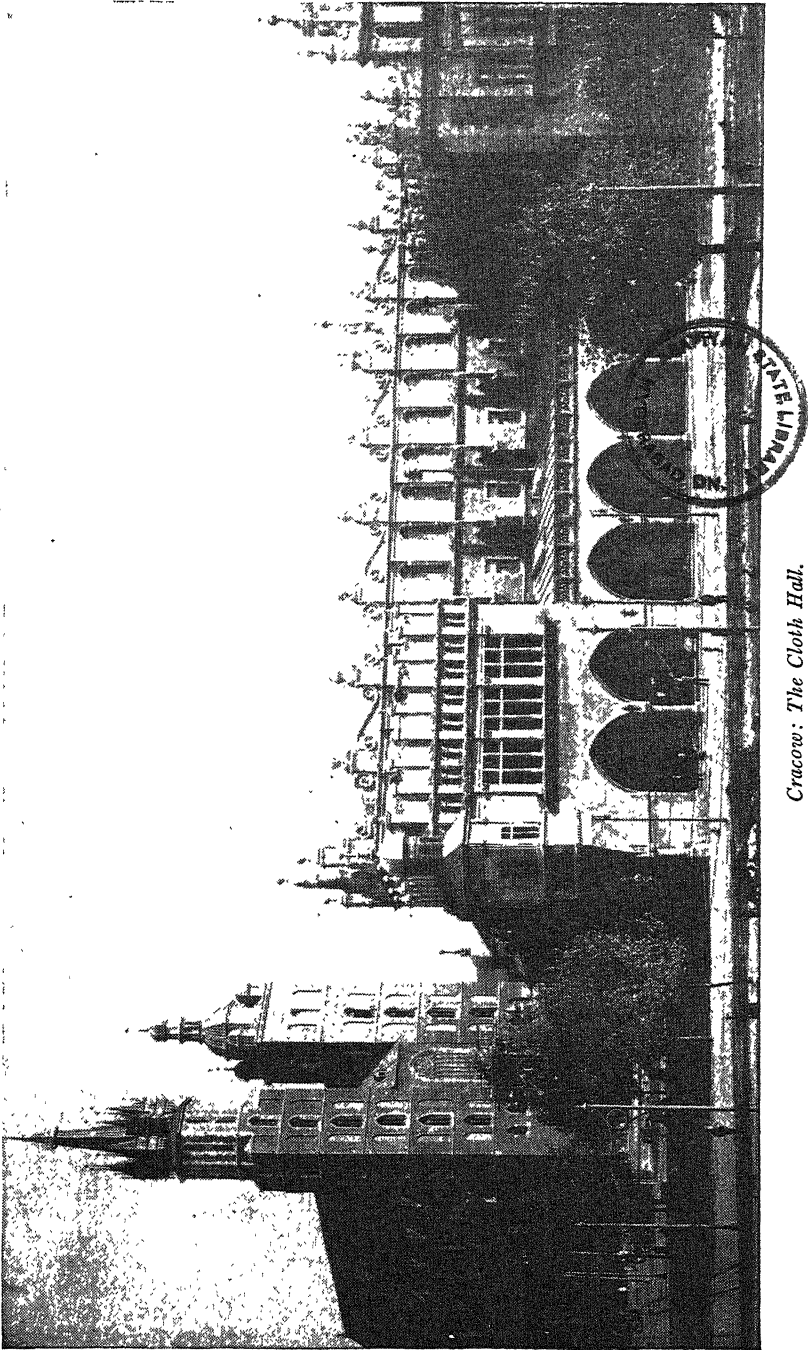
Cracker State, popular name for the State of Georgia.

Crackle Ware, or **Cracklin**, a Chinese pottery whose decoration consists of a network of cracks giving it the appearance of being broken without falling apart. Various theories have been advanced as to the process employed in its production, one being that steatite was mixed with the glaze and that the piece before firing was exposed to

strongly marked rhythm in $\frac{2}{4}$ time, and frequently having words sung to the tune.

Cracow, or **Kracow**, (Germ. *Krakau*), fortified city and archiepiscopal see, Poland, on the left bank of the Vistula; 160 m. s.w. of Warsaw. Viewed from a distance, Cracow presents an imposing appearance by reason of its many churches and towers, and the castle perches high above the city. Among the churches are the beautiful Gothic cathedral church, built in 1320-59 on the site of an 11th-century edifice. The most imposing of the secular buildings is the castle or citadel, first built in the 14th century, used after 1846 as a barrack and hospital and more recently restored as a national museum.

Cracow is the center of a large trade in agricultural produce, salt, timber, cloth, and linen, and manufactures machinery, chemi-



Cracow: The Cloth Hall.

cals, beer, sausages, oils, and tobacco. About 8 m. to the s. are the famous salt mines of Wielicka. The population numbers 191,385. In the 11th century Cracow (Lat *Cracovia*) was made the see of a bishop. After being destroyed by the Mongols in 1241, 1260, and 1281, the city was rebuilt by German immigrants in 1257, and in 1320 was chosen by King Ladislaus Lokietek as the capital of Poland—a dignity which it enjoyed down to the year 1610, when it was supplanted by Warsaw. The partition of Poland, in 1795, bestowed it upon Austria, though from 1815 to 1846 it was the capital of a small semi-independent state. From 1849 until the close of the Great War it formed a part of the Austrian crownland of Galicia, when by the Treaty of Versailles it was allotted to Poland. Cracow was captured by the Nazi German army in Sept. 1939 and was placed under Ger. control when Poland was once more partitioned, this time by Ger. and Russia.

Craddock, Charles Egbert, pseudonym of MARY NOAILLES MURFREE

Cradle, in building, a timber frame in which rest heavy or unwieldy objects which it is desired to sustain in a position otherwise involving a state of unstable equilibrium. In mining the term is applied to a primitive machine formerly used for gold washing (see GOLD)

Craddock, Sir Christopher (1862-1914), British naval officer, was born in York co. In 1900, for gallantry at Tagu (China) he was promoted Captain, and in 1910 was made Rear-Admiral. Early in the Great War he was sent with a small squadron to protect the southern trade routes. He sighted the German ships off Coronel, Nov. 1, 1914, a battle ensued, and Craddock's flagship the *Good Hope* was sunk and he was drowned.

Crafts, James Mason (1839-1917), American chemist, was born in Boston, Mass. He was professor of chemistry at Cornell (1868-70), and at the Massachusetts Institute of Technology (1871-5). He was then in Paris (1875-91), during which time he carried on important research work in collaboration with Charles Friedel, the chief result of which was the development of a synthetic method for the production of new carbon compounds through the catalytic action of chloride of aluminum. In 1892 he rejoined the Massachusetts Institute of Technology as professor of organic chemistry, and from 1898 to 1900 was president of that institution. He published *A Short Course of Qualitative*

Chemical Analysis (1869) and numerous scientific papers

Crafts, Wilbur Fisk (1850-1922), American clergyman, was born in Fryeburg, Me. Dr. Crafts founded the American Sabbath Union in 1889, and from 1895 until his death was superintendent of the International Reform Bureau. He edited several church periodicals, and wrote extensively for and about the young.

Craig, John (?1512-1600), Scottish reformer, was born in Aberdeenshire, was educated at St. Andrews, and entered the Dominican order. He joined the reformers, was appointed minister of Holyrood (1561), and colleague of Knox in the High Church (1563). His attitude to Mary was less irreconcilable than was that of Knox and he was one of the moderate party in the disputes between the kirk and James VI., to whom he was chaplain (1579-94). He was twice moderator of Assembly, and was author of the *Short Confession, or National Covenant of 1580*. Consult Craig's *Catechism*, ed. T. Graves Law.

Craig, Sir Thomas (1538-1608), Scottish jurist. His chief works are a treatise, *De Hominio* (1605), on the early relations between England and Scotland; and his *Jus Feudale*, written to prove the common origin of feudal law in both countries.

Craighead, Edwin Boone (1861-1920), American educator, was born in Ham's Prairie, Mo. He was president of Clemson College, Central College, Missouri State Normal School, Tulane University (1904-12), and the University of Montana (1912-15). He was a member of the American Board of the *Hibbert Journal*.

Craighill, William Price (1833-1909), American military and civil engineer, was born in Charlestown, Va. (now W. Va.). He superintended the construction of defences at Pittsburgh, Pa. (1863), and in 1865 was brevetted lieutenant-colonel for his services 'during the war and particularly in the defence of Cumberland Gap and the ulterior operations of General Morgan's forces.' After the war he was engaged in the construction or improvement of harbor defences; was president of the American Society of Civil Engineers (1894-5), and in 1895 became chief of engineers of the U. S. Army, with the rank of brigadier-general. He translated (1863) Dufour's *Cours de tactique*, and with Mendell (1862) Jomini's *Précis de l'art de guerre*; and compiled an *Army Officer's Pocket Companion* (1861).

Craik, Dinah Maria Mulock (1826-87), English novelist, was born in Stoke-upon-Trent. She produced her first novel, *The Ogilvies*, in 1849, and several others appeared before the publication of *John Halifax, Gentleman* (1856), by which her reputation was established. Her other works include *A Life for a Life* (1859), *The Little Lame Prince*.

Craiova, town, Roumania, on the Jiu River; 115 m. w. of Bucharest. It was for a time the capital of Little Wallachia; and in the Great War was occupied by the Germans; p. 63,063.

Cram, Ralph Adams (1863-1942), American architect and writer, was born in Hampton Falls, N. H. He was educated at Princeton University and in 1889 began to practise as an architect. His firm, whose personnel has undergone several changes, has designed some of the most notable ecclesiastic and academic edifices in the United States, among which are the Graduate Tower, Princeton University; Williams College buildings; St. Paul's Cathedral, Detroit; St. Thomas' Church, New York City; St. Albans Cathedral, Toronto; Cathedral of St. John the Divine, New York City; and Choate School, Conn. He was supervising architect for Princeton University, Bryn Mawr College and Wellesley College. His publications include *Church Building* (1901); *Walled Towns* (1919); *Towards the Great Peace* (1922).

Cramer, Johann Baptist (1771-1858), Anglo-German musician, was born in Mannheim, but went as a child to London where he lived for most of his life. Almost entirely self-taught, and a disciple of Haydn and Mozart rather than of Beethoven, Cramer was the foremost pianist of his day. His *Eighty-four Studies* is an accepted classic in the musical world.

Cramp, a metal bar with both ends bent over at right angles. It is used in masonry form firmly connecting adjacent blocks of stone, each end of the cramp being let into a stone and secured with cement or lead.

Cramp, the sudden, painful, and involuntary contraction of a muscle or group of muscles. In persons who are subject to it, cramp is apt to come on under the influence of fatigue or cold.

Cramp, Charles Henry (1828-1913), American shipbuilder, was born in Philadelphia. He was president of the Cramp Shipbuilding Company, the largest concern of the

kind in the United States. The firm has built many of the vessels of the U. S. Navy.

Crampton, Henry Edward (1875-), American zoologist, was born in New York City. He was professor (since 1904) of zoology at Columbia University; and in 1909-20 curator of invertebrate zoology at the American Museum of Natural History. He has taken part in various scientific expeditions and is the author of *The Doctrine of Evolution* (1911), and of several monographs.

Crampton, Thomas Russell (1816-88), English engineer, was born in Broadstairs, Kent. For several years he worked under the elder Brunel, and afterward under Daniel Gooch, by whose direction he designed the first locomotive for the Great Western Railway. Between 1842 and 1847 he improved his 'Crampton' locomotive and in 1851 he succeeded in laying the first working cable for a submarine telegraph between Dover and Calais.

Cranach, Lucas, also known as 'Lucas Müller' (1472-1553), German painter, was born in Kronach, Upper Franconia. Berlin has the finest collection of his pictures, including *Hercules and Omphale* and *The Fountain of Youth*, typical examples of his realism.

Cranach, Lucas, 'the Younger' (1515-86), German painter, second son of Cranach 'the Elder,' whose pupil he was. He became burgomaster of his native town, Wittenberg, which has his *Crucifixion*, *Nativity*, and *Lord's Supper*. The woodcuts in Luther's Bible (1542) are from his designs.

Cranberry, the fruit of the genus *Vaccinium*, much grown in North America. It is a trailing evergreen shrub with oval leaves and small pinkish flowers. The fruit, a small, firm, red berry on a slender stem, ripens in September and October. There are two species, the small *V. oxycoccus*, and the large *V. macrocarpum*, which is native to acid swamps in the cooler parts of the United States and Canada. The small cranberry is found in North America, Europe and Asia. There are three centres for cranberry cultivation in the United States, Massachusetts, where it began and whence comes the largest proportion of the berries; New Jersey; and Wisconsin. Nova Scotia is also an increasingly important centre for cranberries. The crop is largely handled by coöperative associations and forms an increasingly important industry in the United States. The chief disease to which the cranberry is liable is scald, a fungous dis-

ease due to *Guignardia vaccinii*, controlled by spraying with bordeaux mixture Consult U. S. Department of Agriculture, *Farmer's Bulletin* No. 176.



Scooping Cranberries, near Cape Cod, Mass.

Cranbrook, Gathorne Gathorne-Hardy First Earl (1814-1906), English public official was born in Bradford. He was Secretary of State for India (1878-80), and Lord President of the Council (1885-92). He was raised to the peerage in 1878.

Crane, Christopher Pearse (1813-92), American painter and poet, was born in Alexandria, Va. He studied art in Italy and his paintings include many Venetian scenes. He made a blank verse translation of the *Aeneid* (1872) and published *Poems* (1844), *The Bird and the Bell, with Other Poems* (1875), and *Ariel and Caliban* (1887).

Crane, an extensive class of hoisting appliances which are capable of both lifting their load and moving it laterally. There are many types, a few, of specially wide utility, have characteristic names, and can be described separately, but most of them are individual adaptations to a particular location or class of service. The motive power for manipulating a crane may be hand, steam, hydraulic, pneumatic, or electric power. At the present time, the steam drive and the electric motor drive are the most important. Cranes having a fixed range of motion are operated by elec-

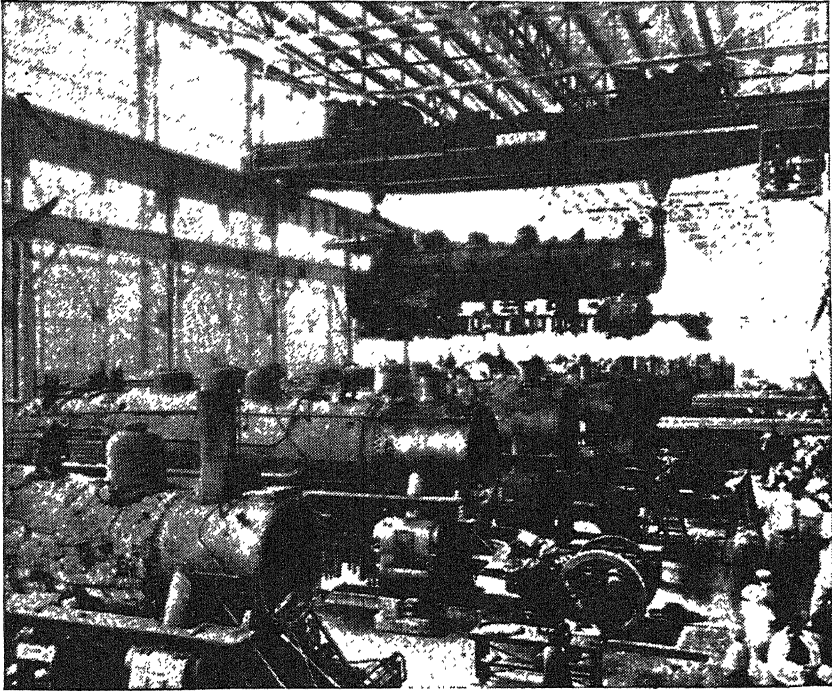
tricity wherever electric power is readily available and those used on construction work are usually driven by steam power. A crane moves its load by lifting, by traversing it along the crane structure, by swinging, the crane being set on a vertical pivot, and by traveling; *i.e.*, by a motion of the entire crane along a suitable track. The hoisting movement is common to all cranes; of the other movements, one, two, or three may be present in a particular crane. These motions are produced either by rope tackle—rarely by chain tackle—or by geared drive, usually acting on smooth-rim carrying wheels. The hoisting motion is practically always worked by rope tackle. The longitudinal travel of the crane is almost always actuated by wheel drive, while for a swinging motion a gear meshing with a circular rack is suitable. The most widely distributed type of crane is the overhead traveling or bridge crane used in shops, heavy manufacturing plants and power stations. It consists of a cross bridge of plate-girders, running on a longitudinal track carried on the side columns of the building; a transverse track of T-rails laid along the girders of the bridge, and a 'trolley' or hoisting carriage running on this latter track. On account of the great convenience of electric operation, such cranes are today nearly always equipped with motor drive. Jib cranes are cantilever structures, the boom on which the hoist hangs or travels projecting out from its support. Jib cranes mounted on a railway truck prove convenient for yard purposes.

For wharf purposes, tower cranes having all four of the motions previously mentioned are often employed. Wharf cranes are used more in Europe than in the United States, where a special field of freight service—ore and coal shipping on the Great Lakes—has produced a remarkable line of cranes and associated devices. Ore and coal unloaders are the most interesting of the cranes just mentioned. The bucket, fixed to a rigid vertical leg, has a scraping motion in closing, which gathers in loose material in the hold of the vessel and secures a full bucket load. It discharges into chutes on the deck of the crane, whence the ore either flows into cars on the tracks below or is delivered to a storage pile at the rear by a conveyor on the gantry frame. An erecting 'traveler' moves longitudinally on tracks set on the erection of false-work, and constitutes a support for all the hoisting tackle required for lifting the members of the bridge into place and holding

them until connected up. The working end of a crane is usually either a hook or a bucket. In handling iron, large electro-magnets have come into extensive use. Such magnets can lift a ton or more, and have the advantage of picking up their load (after being lowered down to contact with it) by the mere throwing of a switch to send an electric current into their windings. See HYDRAULIC and ELECTRIC MACHINERY.

crane (*G. mexicana*), somewhat smaller and a slate-gray in color

Crane, Stephen (1870-1900), American author, was born in Newark, N. J. He was war correspondent in the Graeco-Turkish and Spanish-American wars and later went to England. His first work of fiction was *Maggie, a Girl of the Streets* (1890), which was well received. It was followed by *The Black Riders and Other Lines* (1895), *The Red*



Travelling Crane Carrying Locomotive.

Crane, a large water-bird related to the herons, various species of which constitute the family Gruidæ. There are about 20 species, the greater number of whom are confined to the Old World. All species are long-legged, long-necked, with the head partly naked, sometimes tufted; the beak longer than the head, straight and compressed; with the wings short but powerful and short tail. The best known is the European crane (*Grus grus*). The two foremost American species are the whooping crane (*G. americana*) which is white with a dull-red cap, and the sandhill

Badge of Courage, a realistic tale of the Civil War, *George's Mother* (1896), *The Third Violet* (1897), *The Open Boat* (1898), *War is Kind* (1899), and *O'Ruddy* (1900).

Crane, Thomas Frederick (1844-1927). American educator, was born in New York City. He was graduated (1864) from Princeton, and was admitted to the New York bar (1866). He was dean of the University Faculty (1902-9) and acting president (1912-13), at Cornell. His publications include *Italian Popular Tales* (1885); *Tableau de la révolution française* (9th ed. 1907); *Miracles of*

the Virgin (1911); *Italian Social Customs of the Sixteenth Century* (1920).

Crane, Walter (1845-1915), English artist of remarkable versatility, was born in Liverpool. He was largely self-taught, was influenced by Botticelli and strongly sympathetic to the ideas of William Morris. His easel pictures are allegorical and fanciful in conception, but too much attention is paid to minute decoration. Grace of composition, however, beauty of flowing line, and skillfully-disposed drapery characterize his productions. Among his notable pictures are *The Bridge of Life* (a fine pictorial allegory), *The Chariots of the Hours*. Several of his drawings and designs for tapestries are in the South Kensington Museum. He illustrated Spenser's *Faerie Queene* and *The Shepherds Calendar*, and several of Shakespeare's plays.

Crane, William Henry (1845-1928), American actor, was born in Leicester, Mass., and made his début in Utica, N. Y., in 1863. He formed a partnership with Stuart Robson which lasted from 1877 to 1889, during which period they produced *Our Boarding House*, *The Henrietta*, and other notable plays. After 1889 Mr. Crane appeared as a star in such productions as *David Harum*, *On Probation*, *The Senator*, and *Business is Business*.

Crane, Winthrop Murray (1853-1920), American public official, was born in Dalton, Mass. He served several years as a member of the Republican national committee and was lieutenant-governor of Massachusetts in 1897-99; governor in 1900-02; U. S. Senator in 1904-13.

Craniata, a name applied to all the higher vertebrates from cyclostomes upwards. The great majority have the notochord of the embryo replaced in the adult by a backbone, and there are never more than eight gill-slits. The groups of Craniata are cyclostomes, fishes, amphibians, reptiles, birds, and mammals.

Craniotabes, a thinning of the skull in spots, generally associated with rickets or syphilis.

Cranium. See **Anthropology**; **Skull**.

Crank ('twist, bend'), in mechanics, a U-shaped bend in any revolving shaft. It is generally used for converting rectilinear reciprocating motion into circular, or the reverse. The handle of a grindstone is a 'single crank' attached to the end of an axis in order to communicate circular motion. The reciprocating rectilinear motion of a piston rod when connected with the crank of a wheel communicates circular motion to the latter. In the 'bellicrank' it merely changes rectilin-

ear motion in one direction into rectilinear motion in another.

Cranmer, Thomas (1489-1556), Archbishop of Canterbury, was born in Aslacton, Nottingham. He taught and lectured at Cambridge, but left the university in 1529 to avoid 'the sweating sickness.' Henry VIII.'s divorce was then prominently before the nation, and to Gardiner and to Fox Cranmer expressed his conviction that the marriage was actually void, being contrary to the law of God, and that it could be dissolved without an appeal to Rome by taking the opinion of the universities. The commissioners reported this to Henry, who sent for Cranmer and commanded him to write a treatise in support of his position. On the death of Warham (1533), Cranmer was created Archbishop of Canterbury. Cranmer was in a measure Henry's tool, and in the matter of Henry's marriages with Anne Boleyn, Anne of Cleves, and Catherine Howard, and their dissolution, was little better than the royal pander. His appeal in favor of Thomas Cromwell showed courage, and he offered (1539) some opposition to the Six Articles 'for Abolishing Diversity of Opinions'; but his character was essentially timid, at least during Henry's lifetime. He was appointed one of the council to govern during the minority of Edward VI. In 1548 Cranmer published his *catechism*, which was a powerful attack upon transubstantiation. Cranmer's two great Protestant points were the repudiation of the papal supremacy, and the importance of the translation of the Scriptures. Although the suppression of the monasteries must not be laid to his charge, history cannot acquit him of blame in connection with the martyrdom of Firth and Lambert, of John Bocher (1550), and several others. When Mary ascended the throne Cranmer was brought to trial. On Feb. 14, 1556, he was stripped of his episcopal robes, and on March 21 he was brought to the stake. Now, at last, the old man became brave, and, putting his right hand into the fire, held it there, saying, 'This hath offended. Oh, this unworthy hand!' *The Life* of Cranmer has been written by Strype (1694), Todd (1831), J. M. Norton (1863).

Crannogs. See **Pile Dwellings**.

Crape (Fr. *crêpe*; Lat. *crispus* 'crisp'), a thin gauzy fabric, woven in loose, even threads of silk, heavily sized or gummed, and crimped in the dyeing.

Crape Myrtle. See **Lagerstoemia**.

Crappies, a fish belonging to the family Centrarchidae, found from the St. Lawrence

and Great Lakes south to Texas and west to the Dakotas and Kansas. It is about a foot long, silvery olive mottled with dark green, and is generally considered a fine panfish; known also as 'bachelor', 'new light', 'bridge perch', and 'John Demon.'

Craps, a game of chance, played for stakes by any number of persons with two dice. The first player, chosen by lot, shoots the dice. If he shoots 2, 3, or 12 it is a crap and he loses the pot, but retains the dice. If he shoots 7 or 11 he wins the pot. If he shoots any other number he continues shooting until he again makes this other number when he wins the pot, or until he makes a 7, when he loses. A player continues playing until he throws a losing seven, whereon the next player takes the dice.

Crashaw, Richard (?1613-49), English poet, who died a sub-canon in Rome. Crashaw's poetical fame rests chiefly on his *Epi-grammatum Sacrorum Liber* (185 in all), published in his 21st year, which, though often whimsical, shows maturity and classical taste; and on his *Steps to the Temple* (1646), which had a great influence on Milton, Coleridge, Shelley, and other poets. The famous line, descriptive of the turning of the water to wine at Cana, 'The modest water saw its God and blushed,' is his.

Crassus, Lucius Licinius (140-91 B.C.), Roman orator and jurist, passed a law banishing from Rome all residents who had not the franchise—a measure which largely induced the social war. Cicero preserves his memory in *De Oratore*.

Crassus, Marcus Licinius, surnamed **Dives** (c. 105-53 B.C.), one of the members of the first triumvirate formed in 60 by Cæsar, Pompey, and Crassus. He sought wealth in every possible way, such as trafficking in slaves, lending money, working mines, and house building. Crassus' position depended on his enormous wealth. Being ambitious of military glory, he entered upon war with the Parthians and was treacherously slain.

Cratægus, a genus of the order Rosaceæ, including a large number of shrubs and trees including the hawthorn and the cock's-spur thorn, which bear oval or globular fruit enclosing a bony stone. Their long, shining thorns and shrubby habit, their masses of flowers, oftentimes shining foliage, brilliant in autumn, and brightly colored fruit make them conspicuous among the smaller North American trees.

Crater. See **Volcanoes**.

Crater Lake National Park, a United

States government reservation in southwest-ern Oregon. Its area is 249 sq. m and its chief point of interest is Crater Lake, which occupies the crater of an extinct volcano. Its waters are of a marvellous blue and are surrounded by a rim of gray lava. See **OREGON**.

Craterus, (?373-321 B.C.), a Macedonian, one of the most trusted generals of Alexander the Great. After Alexander's death Antipater and Craterus jointly governed Greece and Macedonia, with the Illyrian and the Epirot tribes.

Crates, of Athens, a poet of the old Attic comedy, who flourished between 449 B.C. and 424 B.C., in which year Aristophanes in his *Knights* speaks of him as a writer of the past, distinguished by the delicacy and refinement of his wit. The fragments of his works which survive are found in Meineke's (5 vols. 1839-57) and Kock's (3 vols. 1880-88) editions of the *Poetarum Comiorum Græcorum Fragmenta*.

Crates, of Mallus in Cilicia, Greek grammarian and critic, especially on the poems of Homer.

Cratinus (519-422 B.C.), an Athenian writer of the old Attic comedy, classed by Horace, along with Aristophanes and Eupolis, as among its chief representatives. We are told that he did not begin to exhibit his plays until about 453 B.C., when 66 years of age; his last play, *The Wineflask*, was produced in 423, when he was 96. In the previous year Aristophanes had spoken of him as a driveling old man, so utterly neglected that he could not even procure enough to quench his thirst. The play mentioned, which won the first prize over Aristophanes' *Clouds*, was his reply. Only a few fragments of his works survive, which will be found in Meineke's (5 vols. 1839-57) and Kock's (3 vols. 1880-8) collections of the *Poetarum Comiorum Græcorum Fragmenta*.

Cratippus, a philosopher from Mitylene, of the 1st century B.C., whose lectures at Athens were attended by both Brutus, the assassin of Cæsar, and Marcus, the son of Cicero. Cicero explains his philosophy, praises his wisdom and his conversational powers.

Craven, Alfred Wingate (1810-79), American civil engineer, was appointed commissioner and chief engineer of the Croton water board of New York City on its organization. In connection with this work the large reservoir in Central Park was built, and the construction of the vast reservoir at Boyd's Corners undertaken.

Crawfish. See **Crayfish.**

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Crawford, Thomas (1814-57), American

following, and who, during his lifetime, was ranked by many with such leaders as John Quincy Adams, Jackson, Clay, and Calhoun, but who connected his name with no measure of great and lasting importance, and who is now almost forgotten.

Crawford and Balcarres, Earls of. The Scottish Earls of Crawford represent the senior branch of the Lindsay family, originally from England, and supposed to be descended from the Norman house of Limesay. See Lord Crawford's *Lives of the Lindsays* (1840) and Jervise's *Land of the Lindsays* (1853).

Crawford, or White Mountain, Notch, a rugged pass in the White Mts., N. H., between Mt. Webster (3,286 ft.) on the e. and Mt. Willey (4,260) on the w. The sides are precipitous, and the bottom for some distance is so narrow as to admit only of the carriage road and river bed.

Crawfordsville, city, Ind. It is the seat of Wabash College (Presbyterian), founded in 1832, and was the home of Lew Wallace the author. Its manufactures include carriages, coffins, lumber, flour, wire fencing, and foundry products; p. 11,089.

Crayfish, or **Crawfish**, a fresh-water crustacean of the family Astacidae or some closely related group, which is nearly allied to the lobster, and has a similar form. Crayfish



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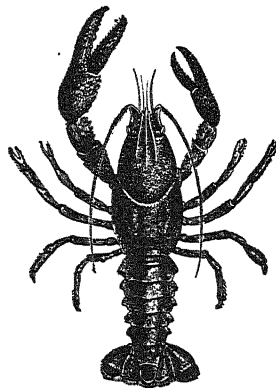
Crawford Notch, White Mountains.

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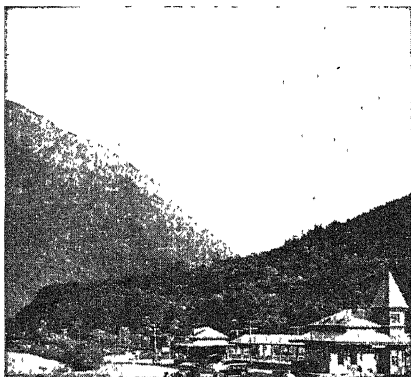


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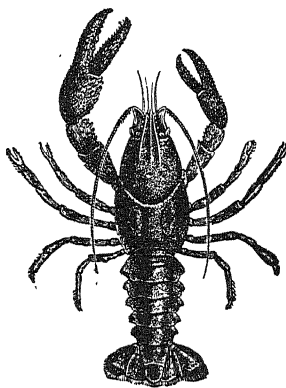
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Crayon, a pencil of chalk, colored or otherwise, used for drawing. A crayon drawing has a delicate softness, with less detail than that of a pencil sketch.

Cream of Tartar, or **Acid Potassium Tartrate**, is obtained from grape-juice, from which it is deposited in a crude form called argol during fermentation. Cream of tartar is a white crystalline solid with a pleasant acid taste, and in small doses acts as a refrigerant and diuretic, and in larger as a purgative. It is also used as a constituent of baking-powder, supplying the acid to act on sodium bicarbonate and to set free carbon dioxide to aerate or 'raise' the bread.

Creasy, Sir Edward Shepherd (1812-78), English historian, is remembered for his *Fifteen Decisive Battles of the World* (1852; 33d ed. 1893), and his standard *Rise and Progress of the English Constitution* (1853; 15th ed. 1886).

Creatine, is an acetic acid derivative of methyl guanidine that occurs in muscle juices. It can be prepared synthetically, but is usually obtained from extract of meat. It is a colorless solid that crystallizes in prisms, has a faint bitter taste, and is easily soluble in water.

Creation. The early literatures of many peoples contain cosmogonies which, though often crude and grotesque, indicate that the question has been for ages a subject of the deepest interest. Thus creation forms an important section of both Jewish and Christian theology, and until recent times men's thoughts about it lay under the domination of the supposed doctrinal statements in Genesis. But in the light of geological discoveries, and especially of the accumulations of facts that support the theory of evolution, the traditional notion of an immediate creation has given place to the theory of a gradual development. During the latter half of the 19th century many attempts were made to reconcile the facts and theories of science with the creation narrative of Genesis, but such adjustments are being recognized more and more as impossible and unnecessary. This result has been brought about not only by the advance of physical and biological science, but to a certain extent by the literary and historical investigation of the Old Testament, particularly of the so-called books of Moses. First of all it was made clear that Genesis contains, not a single self-consistent account of creation, but two descriptions, differing considerably in both language and substance.

As to the value of the story in Genesis, to admit its inconsistency and its derivative character, and above all its irreconcilable differences from the conclusions of physical science, is not necessarily to impugn the inspiration of Scripture. The worth and the prerogative of the Bible do not lie in its capacity to teach science, but in its moral and spiritual influence. We have no more right to expect that Scripture will anticipate a scientifically accurate discovery of the method of creation than we have to demand that it should have contained a statement of the Copernican system or the Newtonian law of gravitation. Science may yet make undreamed-of discoveries as to the origin and nature of matter; it may even fill up the gaps in the evolutionary process, such as the organic; but it is inconceivable that it should ever make any discovery that will disprove the simple and majestic truth, first revealed to the chosen people, that the world was made by the one living and true God.

Creationism, Pre-existentialism, and Traducianism, three famous theological theories, regarding the origin of individual human souls. According to pre-existentialism, each soul has been in existence either from all eternity or from the creating of the world, the birth of the individual being viewed as the conjoining of the soul and the body in one person. Traducianism supposes that the distinct souls have developed from the soul of Adam by a kind of division of the soul-substance, as, for example, shoots from a tree. According to creationism, God creates the individual soul on the occasion of the generation of the body. This is the orthodox theory. See Dorner's *System of Christian Ethics* (1887); Hodge's *Theology*.

Cr billon, Prosper Jolyot de (1674-1762), French dramatist. In 1705 he produced his tragedy of *Idom ne*, which gave him a reputation; *Atr e et Thyeste* succeeded (1707), with *Electre* in 1709, and *Rhadamiste et Z nobie* in 1711. It is upon the last-named play that Cr billon's fame chiefly rests though he wrote others later. Though inferior to Voltaire as a tragic dramatist, Cr billon frequently rises to dignity and grandeur in his verse. His *Œuvres Compl tes* were published in 1875, and a new edition in 1885.

Creche (Fr. 'cradle'), a public nursery, where children of the poorer classes are cared for while their mothers are at work or ill.

Cr cy-en-Ponthieu, or **Cressy**, vil., France, 14 m. n. of Abbeville, the scene of

Edward III's victory over Philip VI. of France (Aug. 26, 1346). In this battle Edward the Black Prince 'won his spurs.' He afterwards adopted as his crest the three ostrich plumes and motto, *Ich Dien*, of the Bohemian king.

Credence. The credence table of a church is the side-table placed within the chancel rails, at the side of the altar, for the reception of the elements and also of the vessels which are used at a celebration of the holy communion. The term was also employed formerly in social life to signify a side table on which dishes were placed and tasted (as a precaution against poison) before being served at the principal table.

Credi, Lorenzo di, properly **Sciarpelli** (1459-1537?), Italian painter of the Tuscan school, much influenced by his fellow-pupil Leonardo da Vinci. Extremely persevering, his constant aim was to master the difficulties of perspective. He had not the highest gifts but he showed a delicate feeling for beauty and a predilection for painting children. Among his chief works are *Madonna with Saints*, *Baptism of Christ*, a *Madonna* (Louvre), a *Birth of Christ*, and a *Holy Family*. See E. J. Poynter's *Classic and Italian Painting* (1880).

Credit implies the transfer of the wealth of one individual to another for a period, after which it is returned to the original owner; and thus involves two distinct notions—confidence and time, the latter of which is in modern business the more important. Credit is organized chiefly in banks with their credit instruments of checks, bank notes, discounts, etc., and becomes a powerful agent in the determination of prices. See H. D. MacLeod's *Theory of Credit*; Veblen's *The Theory of Business Enterprise*; and Willis and Edwards' *Banking and Business* (1922).

Credit, Letter of, is a letter addressed to a banker containing a request to make advances and payments to a third person on account of the writer of the letter. It may be addressed, not to one, but to a number of bankers; in this case it is called a circular letter of credit or a circular note. These circular notes have proved of great advantage to travellers, being a safer means of carrying money than either notes or gold.

Crédit Foncier of France was founded in 1852 by the economist Wolowski, under governmental patronage, as a kind of mortgage bank, to enable landowners to raise money at a low rate of interest, capital and interest

being repayable in the form of a terminable annuity.

Crédit Mobilier, founded in 1852 to correspond with the *Crédit Foncier* and make advances on movable property, as the *Crédit Foncier* did on immovable property. A similar company, formed in London in 1864 became fused with the *Crédit Foncier* of London, and two years later was completely merged in it.

Crédit Mobilier of America, a corporation chartered by the state of Penn. (1859), and subsequently reorganized (1867) by Oakes Ames and others for the purpose of aiding in the construction of the Union Pacific Railroad, the stockholders in the railroad company and the *Crédit Mobilier* being in large part identical, and Oakes Ames being at the head of both. In 1868 Oakes Ames, then a member of Congress, sold to certain of his fellow-congressmen *Crédit Mobilier* stock at a price, it was alleged, much below its true value, and this gave rise to what is probably the greatest scandal in American political history, the charge being made that Ames had virtually bribed Congressmen with a view to securing favorable legislation. Among the Congressmen accused of corruption were James G. Blaine, James A. Garfield, and James Brooks. A committee of investigation appointed by the House of Representatives failed to secure conclusive proof of corruption against any of the men involved. Consult Crawford, *The Crédit Mobilier of America* (1880), and Haard, *The Crédit Mobilier of America* (1881).

Creeds. Creeds do not in essence differ from confessions. Both are authorized formulas of a church; but whereas confessions are not generally used liturgically, creeds are. Of two out of the three Christian documents called creeds, we cannot tell with any exactness how they were formulated into being. The *Apostles' Creed* seems to have gained its present shape by a process of accretion. The early form of the *Apostles' Creed* used to be regarded as distinctively Western; some now suppose that a common nucleus existed both in West and East. The present form is found first (c. 500) in a mixed collection of Gallikan and Roman authorship. All this seems to favor the idea of free interchange and borrowing between churches.

The *Nicene Creed*, in its first form, was drawn up at the Council of Nicæa (325). It sprang from controversies regarding the person of Christ. Additions and abridgments

were afterward made, the history of which is obscure. The Western churches in the 6th century added a phrase (*filioque*) to denote that the spirit proceeds not from the Father only, but also from the Son. This led to the secession in the East, from which the Greek Church was formed. The creed in the liturgies differs somewhat from that of the councils. The *Athanasian Creed* is not the work of Athanasius. It was formerly attributed to the end of the 8th century, but is now assigned to the 5th century. Consult Green's *The Christian Creed and the Creeds of Christendom*.

Creek, etymologically cognate with *crook*, denotes any deflection from the straight line, and specifically, in physical geography, an inlet of any large sheet of water. In North America and Australia small rivers are frequently called creeks.

Creeks. See *Muskhogeans*.

Creep. See *Climbing Plants*.

Creepers (Certhiidae), a family of passerine birds, who spend most of their lives creeping up and around the trunks of trees and over rocks. The bill is long and decurved; the plumage usually a soft inconspicuous brown; the tail short and square, in some species; long and pointed, with stiff feathers, in others.

Crees, North American Indians of Algonquin stock and speech. They live chiefly in Manitoba and in Northwest Territory. They are closely related to the Chippewa in language and customs.

Creighton, Mandell (1843-1901), English clergyman and historian, visited the United States in 1886, where he represented Emmanuel College, Cambridge, at the 250th anniversary celebration of Harvard University. A broad-minded, tactful and charming personality made him an outstanding figure in his time. His writings, which are of high rank, include *Simon de Montfort* (1876); *Age of Elizabeth* (1876); *Cardinal Wolsey* (1888); *History of the Papacy* (6 vols. 1882-1894), a monumental work of accurate scholarship and impartial treatment; *Queen Elizabeth* (1896); *Thoughts on Education* (1902).

Creighton University, a Roman Catholic institution of learning at Omaha, Neb., chartered in 1878 and named for its founder. The college was founded and has been maintained as a free institution.

Crelinger, Auguste (1795-1865), German actress, made her début in 1812, and became one of the leading tragediennes of

the day. She also excelled in comedy and enjoyed great popularity.

Cremation, the process of disposing of the bodies of the dead by reducing them to ashes. Many of the American Indian tribes burned their dead. Cremation was the general practice of the civilized world previous to the time of Christ. Egypt, China, and Judæa were exceptions to this rule, and, in the case of each, the belief in the resurrection of the body was undoubtedly the cause of their resorting to embalming and burial instead of burning. In Greece only suicides, people struck by lightning and infants were denied the right of cremation. In Rome the practice persisted through four centuries of the empire. With the spread of Christianity, it was slowly supplanted by the Christian rite of burial. It is said that Charlemagne, in order to stamp out cremation, punished the act with death. It is still practised in India and among some other Oriental nations.

In Great Britain cremation was discussed as early as 1658, when Sir Thomas Browne published his quaint treatise, entitled *Hydriotaphia or Urn Burial*. In 1874, Sir Henry Thompson put forward in the *Contemporary Review* a strong argument for cremation on the ground that it was a necessary sanitary precaution against the propagation of disease. The outcome of this article was the formation of the Cremation Society of England, which promptly erected a furnace at Woking. But, on account of legal obstacles, no cremation was carried out until 1885. Since that date the annual number of cremations has steadily increased in England. And throughout Europe there has been a steady growth in legalization and practice of cremation. In the United States the first crematory was built at Washington, Pa., in 1876, and here, during the next seven years, 25 cremations were performed. In 1881 another and much more pretentious crematory was built in what is now a part of New York City. The movement has grown steadily and by 1930 there were crematories in most of the larger cities. Modern cremation is an altogether different process from that which existed among the ancients. The slow-burning pile of wood in the open air has been superseded by the rapidly-acting furnace of high temperature. There is no flame, no smoke, no odor; only from 4 to 6 pounds of white mineral residue of the body remains. The time required for incineration is from 50 to 80 minutes. The residue is then placed in a

metal receptacle, sealed and labelled and given to friends for disposition. A chapel is connected with most crematories, where service may be held if desired.

Advocates of cremation contend that it is a sanitary and an economic measure which the increasing size of great centres of population makes necessary. Objections to cremation on the other hand are largely of a sentimental nature. In the case of violent death it is urged that cremation, by obliterating all traces of the body, may also remove all traces of possible crime.

Consult Freeman's *Crematoria in Great Britain and Abroad*; Dowd's *Funeral Management and Costs* (1921).

Crème de Menthe. See *Menthe*.

Cremer, Jakobus Jan (1827-80), Dutch novelist. Among his chief novels are *Anna Rooze* (1867; Eng. trans. as *An Everyday Heroïne*, 1873), *Dokter Helmond* (1870), and *Hanna de Freule* (1873). He also wrote dramatic pieces, such as *Boer en Edelman* (1864) and *Emma Bertholt* (1865). A collection of his novels appeared as *Romantische Werken* (12 vols., 1887-8).

Cremer, William Randal (1838-1908), British advocate of international peace. In 1887 he founded the Inter-Parliamentary Conferences to further the cause of peace and was editor of the *Arbitrator*, a publication devoted to the same cause. In 1903 he was awarded the Nobel peace prize which he used as an endowment to the International Arbitration League.

Crémieux, Isaac Moïse, commonly called **Adolphe** (1796-1880), French lawyer and statesman, became widely known through his defence of *Le National*, *La Tribune*, and other journals, in connection with the Orient question (1840). He also eloquently defended his Hebraic co-religionists, and was one of the founders (1860) of the Alliance Israélite Universelle. In 1869 he came forward to defend the right of public meeting. In the government of National Defence as minister of justice he issued the decree which conferred French citizenship upon the Jews of Algeria.

Cremona, town and episcopal see, Italy, capital of Cremona province. It is still surrounded by its mediæval walls, and is irregularly built. Its chief ornament is the cathedral (1107-90), with frescoes by Porde none and other artists. There are other interesting churches, all adorned with paintings by artists of the Cremona school (16th century). There are also several old palaces,

some of them restored in the 19th century. The chief industries are the manufacture of silk, cotton, cloth, stringed instruments, and sweetmeats. It was formerly famous for its violins, the chief makers of the Cremona school being the Amati, Guareri, and Stradivarius. The town was founded by the Romans in 219 B.C.; p. 59,056.

Cremona, Luigi (1830-1903), Italian mathematician and educator. It is to him that mathematical education in Italy owes its complete reorganization. His more important works are *Le figure reciproche nella statica grafica* (3d ed. 1879); *Elementi di geometria proiettiva* (1873)—both translated into English and published by the Clarendon Press.

Creole, a name given to people born and naturalized in the West Indies or the tropical countries of America but of European (usually Spanish or French) origin, as distinguished from the offspring of mixed blood, as mulattoes and quadroons, from negroes and from aborigines.

Creole Case, an incident occurring in American history which was the occasion of a diplomatic difficulty between the United States and Great Britain and of a vigorous debate in the United States Congress between the pro-slavery and the anti-slavery members. The brig *Creole*, engaged in the coast-wise slave trade, started Oct. 27, 1841, from Hampton Roads, Va., to New Orleans, La., with a cargo of about 130 slaves. On Nov. 7, 1841, seventeen of the slaves mutinied and, killing one of the owners of the vessel, carried the *Creole* into the British port Nassau. The British authorities immediately freed all of the slaves except those immediately concerned in the mutiny, who were held on a charge of murder, and the British government refused to accede to the demand of the United States that all the slaves be surrendered, the contention of the United States (made through Secretary of State Webster) being that according to international law property on vessels carried by unlawful force or by stress of weather into a foreign port was exempt from interference, while Great Britain contended that slavery was unrecognized by British law, and that 'air makes free.'

On March 21, 1842, Joshua R. Giddings introduced in the House of Representatives a series of resolutions which were intended to combat the position assumed by Webster in his correspondence with the British gov-

ernment. The resolutions were not adopted.

Creole State, a popular name for LOUISIANA.

Creon, in Greek legend, brother of Jocasta, mother of Œdipus. He governed Thebes until Œdipus was called to the throne; and later he ruled the city again.

Creosote, the name applied to wood-tar and coal-tar distillations extensively used in medicine and in the industrial arts.

Wood-tar creosote, derived from the distillation of beechwood, is an oily, colorless, transparent liquid and has a penetrating odor resembling that of wood smoke. It is powerfully antiseptic.

Coal-tar creosote is a mixture distilled from coal-tar. It is of greater commercial value than wood-tar creosote and finds its largest application in the treatment of wood, especially railway sleepers, piles, and telegraph poles. It is also employed as a fuel, particularly for Diesel engines; in the preparation of disinfectants and sheep-dips; and in generating artificial light in specially designed lamps.

Crepuscular Rays, rays not infrequently seen when the sun is near the western horizon and detached clouds are gathered around the solar disc. On such occasions the floating dust and aqueous vapors assume the form of beams emanating from the centre, known as crepuscular rays, or diverging beams.

Crescendo, a musical term denoting a gradual increasing from piano to forte and fortissimo.

Crescent, the increasing or new moon, which shows a curving rim of light, terminating in points or horns. The crescent is the symbol of the Ottoman Turks and the word is applied to the Turkish standard, and, figuratively, to the Turkish power, or the empire of the Crescent. In heraldry the crescent is an honorable ordinary, often used as a mark of distinction for the second sons of families, or those descended from them.

Crescent City, New Orleans.

Crescentia. See **Calabash**.

Crescimbeni, Giovanni Mario (1663-1728), Italian literary historian. In 1690, together with Gravina and others, he founded the Academy of the Arcadia. His principal work is the *Istoria e Commentari della volgar Poesia* (1698).

Cresol, any of the three isomeric methyl phenols, obtained in the distillation of wood or coal. They are oily liquids, resembling carboic acid, and are used as antiseptics, and

in the preparation of some coloring matters.

Crespi, Daniele (1590-1630), Italian painter. An able artist, he also possessed an accurate observation, a facile hand, and excellent judgment. His coloring in oil and fresco is beautiful, occasionally recalling Titian. His most remarkable works are *Pictures of the Life of St. Bruno* and the *Descent from the Cross*. His father, Giovanni Battista, called Cerano (1557-1633), has a fine symmetrical picture, *Madonna del Rosario*, in the Brera Gallery, Milan.

Cress, a name given to several species of the Cruciferae, the leaves of which have a pungent taste and are used as salads and condiments, and for garnishing. The Common or Garden Cress is easily grown. Watercress is the most favored species for use as salad. Other varieties are the Upland Cress (*Barbarea præcox*), the common Winter Cress, and the Cuckoo-flower known also as Bitter Cress, and as Lady's Smock.

Cressy. See **Crécy-en-Ponthieu**.

Crest, the heraldic figure surmounting the helmet. Although crests were used to adorn helmets, and probably even as personal cognizances, in pre-heraldic ages, just as plumes are still used to distinguish regiments, it is on their heraldic significance that they are now generally regarded. By a popular misconception the crest is often supposed to be the most important item in an armorial achievement. This is not so; the coat of arms is complete without it, and in many cases it is absent altogether. Since arms ceased to be personally worn, and heraldry became practically pictorial, many very incongruous devices, which could not have been attached securely to a helmet, have been adopted as crests. Whatever their form, they should always be set on a wreath or a crest coronet, even when represented without the helmet. See **HERALDRY**.

Crest, in Gothic architecture, a floriated ornament finishing the gable or roof of a building, prevalent during the 13th and following centuries. It consisted of a low screen of stone of beautiful workmanship, usually foliage, conventionally treated.

Creswick, Thomas (1811-69), English landscape painter, exhibited at the British Institution and at the Royal Academy, being elected A.R.A. (1842) and R.A. (1851). He etched plates for Gray's *Elegy*, Milton's *L'Allegro*, and Goldsmith's *Deserted Village*. His painting of atmosphere and his knowledge of color-effects sometimes recall Turner.

Cretaceous System, a geological system

so called from the white chalk, which is its best known and most characteristic rock in its European development. The Cretaceous in North America covers an immense area. The time includes 1. a period of warping of the continental surface with heavy sedimentation, especially in Texas and Mexico; 2. an interval of erosion; 3. a period of widespread submergence of the land and encroachment of the sea from all sides, especially from the Gulf of Mexico, which in this period extended the full length of the continent to the Arctic Ocean. The sediments belonging to the first period of submergence are usually known as Lower Cretaceous, and those above the unconformity belonging to the later submergence are known as Upper Cretaceous. The classification varies much for different regions; they are shales, sandstones, limestones, and marls, with many coal beds, especially in the Laramie formation.

In Mexico the Lower Cretaceous is estimated to reach the extraordinary thickness of 20,000 ft. The Upper Cretaceous in the Western interior region reaches 1,300 ft. as the known maximum at any one locality.

The fauna and flora of Cretaceous times were rich and varied. Of the larger vertebrates, the most important were the reptiles, of which there were many groups now no longer in existence. Huge land reptiles (dinosaurs), sea snakes (mosasaurs), winged reptiles (pterodactyls), and many other types, inhabited the land or sea.

Many of the existing genera of trees are already represented in the Laramie in America; and the flora as a whole has quite a modern aspect, while the animals are of characteristic Mesozoic forms. Over much of Europe and America the Cretaceous has been little disturbed, but in the Alps, the Himalayas, the Caucasus, and the Andes it has been raised to thousands of ft. above the sea-level. The close of the Cretaceous was one of the most extensive mountain-making periods in geologic history. As a rule, its economic importance is not great; but in America and England Cretaceous rocks furnish chalk, flint, clay, cement, coprolites, fertilizer marl, lignite, bituminous coal, and asphaltum. Nearly all of the coal west of the Mississippi valley is of Upper Cretaceous age. It is estimated that there are more than 100,000 sq. m. of coal-bearing lands lying along the base of the Rocky Mountains belonging to this system. Consult *Reports* of the State and National geological surveys.

Crete (Ital. *Candia*, from Ar. *Khandak*;

Turk. *Kirid Adası*) is the principal island of the chain which divides the Greek Archipelago from the eastern basin of the Mediterranean Sea. Its greatest length is 160 m. and its breadth varies from 30 to 7 m.; p. of the island, 386,400.

The surface consists of a series of four main mountain masses from w. to e. The s. coast is rugged, and difficult of access: the n. coast has extensive alluvial plains; long stretches of beach; small landlocked ports, and one great natural harbor at Suda Bay, one of the finest of the Mediterranean harbors. Snow lies all the year round on the higher peaks, but seldom falls in the lowlands. The temperature range is from 40° to 98°, and the great heats of summer are tempered by persistent north winds. Malaria is troublesome locally, but otherwise the island is healthy. The agrimi, a wild goat, practically confined to Crete, survives among the mountains. Other animals are the moufflon, and the porcupine. There are no venomous snakes in the island; according to the legend they have been exterminated by Saint Titus, the first bishop of Crete. The mules of Crete are considered to be among the best in the world. The staple produce is olive table-oil. The more accessible sections of the island are covered with a network of important highways, while in the remote districts there are only rocky paths.

The population in historic times has remained essentially Greek. At the Turkish conquest (1645 A.D.) a large proportion of the Cretans embraced Islam; but they retained the Greek language and many Greek customs, and even their family names, so that there were many families having members both Christian and Moslem. In recent years there are few if any Moslems on the island. The picturesque Levantine dress—soft red cap with tassel, short jackets, wide trousers, and high top-boots—is still commonly worn, even in the towns.

Greek tradition ascribed to 'hundred-cities' Crete a predominant place in prehistoric times, and the legends of the 'sea power of Minos' are amply confirmed by the discovery at Knossos and elsewhere of the relics of an advanced civilization which culminated in the latter bronze age (1500-1300 B.C.), and collapsed shortly after, at the moment of the introduction of iron. The legend runs that the highest god of the Greeks, Zeus (Jupiter), was born in Crete and that Minos, the King, was his son. Crete became proverbial for its internal quarrels, and in Hellenistic times (700-70 B.C.) was a dangerous nest of adventurers

and pirates, with an important Jewish colony. Annexed by Rome in 68 B.C., and already the seat of a Christian community within the lifetime of St. Paul, it became, after the partition of the Roman empire, a province of its eastern part, the Byzantine empire. It was granted, in 1204, to Boniface who sold it to the republic of Venice. Venetian oppression and the quarrels of the Greek and Latin Churches made a Turkish conquest easy in 1645. Persistent revolts of the whole island culminated in 1898 in the establishment of Prince George of Greece as high commissioner under the protectorate of Great Britain, France, and Russia (which jointly maintained a nominal garrison), with a National Assembly, popularly elected, and an administration of European type, the Sultan retaining nominal suzerainty only and Greece being put in almost complete control. In 1908, the Cretans again asked for a reunion with Greece and, though this state made no attempt to occupy the island, the Cretan government, notwithstanding the Turkish representations, administered the island in the name of the King of Greece until the first Balkan War. By the Treaty of London, Turkey renounced all sovereignty over the island. In 1941 the Nazis captured it from its British defenders. It was retaken, 1943. Capital, Canea; p. 26,604.

Crete is archaeologically important owing to its prehistoric remains which have been the subject of systematic exploration since 1894. In 1906 Dr. Arthur Evans published the report of his excavations at Knossos and his discovery of the palace of King Minos. This palace is spacious and luxurious, with many chambers decorated with fresco paintings. The symbol of the double axe (labrys) on its stones, makes certain that the kings worshipped the great diety, whose symbol it was. It is supposed that this palace with its great number of chambers and corridors, was the mythical Labyrinth (the name of which is of the same root with labrys) in which Minos enclosed the Minotaur, a bull-headed monster. Many wall paintings representing scenes of peace and war have survived. Hundreds of written documents were also found which are probably the accounts relating to the stores, which were in a series of rooms containing stone chests and large jars. Since that time exploration has gone on steadily and many valuable remains throwing light on an ancient civilization have been unearthed. Consult Freese's *A Short History of Crete*; Burrows' *Discoveries in Crete*; Evans' *Scripta Minoa* and *The Palace of Minos at*

Knossos (1921); Seager's *Excavations in the Island of Psira and Excavations in the Island of Mochlos* (1912); E. H. Hall's *Excavations in Eastern Crete, Vrokastro* (1914); Baikie's *Ancient Crete* (1924).

Crete, city, Nebraska, in Saline co. on the Blue River, and on the Chicago, Burlington and Quincy and the Missouri Pacific Railroads; 2½ m. s.w. of Lincoln. It is the seat of Doane College (Cong.). It has nurseries, dairies and flour mills; p. (1940) 3,038.

Crétineau-Joly, Jacques (1803-75), French historian. His more important works are *Histoire de la Vendée* (1840-2, new ed. 1896-97), *Histoire religieuse, politique, et littéraire de la Compagnie de Jésus* (6 vols 1844-6), for which he utilized authentic and hitherto unpublished documents, but which is nevertheless somewhat biased. A part of it was translated into English, under the title *The Poor Gentlemen of Liège; being the History of the Jésuits in England and Ireland for the Last Sixty Years* (1863).

Cretinism, a disease, generally congenital, associated with absence, atrophy, or disease of the thyroid gland, and characterized by imperfect bodily and mental development. It is also called congenital myxedema. Cretinism is found in all parts of the world, and in all ranks of society, but is most common in certain deeply sunk valleys of the Alps, in Italy, France, and Austria. The cretin shows signs of the disease at an early age, but often the parents fail to notice anything until after the period when a healthy child would have begun to 'take notice.' In a cretin the fontanel tends to remain open; even from birth the mouth tends to be continually open, and the tongue to protrude. The hands are broad, with short, thick fingers; the child has a slow bodily development, and it is altogether markedly dull and unobservant. From birth it tends to be extremely constipated, and the skin all over the body becomes very early thick, dry, and loose, and shows wrinkles on the forehead. As age increases, the backwardness of bodily and mental development becomes more recognizable. The child is, in fact, a dwarf imbecile, with stunted limbs, scanty gray hair, a waddling gait, when it walks at all, and with a prominent abdomen. The temperature is always subnormal. Success in treatment depends upon the age at which it is begun, the only form being the administration of the thyroid gland of the sheep, whole or in part.

Cretonne, a name, said to be that of its inventor, originally applied to a strong white

cloth made of hemp and flax, but since 1860 to a woven material of fine wool or cotton, printed in colors with flowers or patterns, and chiefly used for curtains and for covering furniture.

Creusa. 1. Daughter of Priam and Hecuba, the wife of Æneas and the mother of Ascanius. See Virgil's *Æneid*, bk. 2. 2. Daughter of Creon, king of Corinth, and wife of Jason after he deserted Medea. The latter sent her as wedding present a dress which, when she put it on, took fire and consumed her along with the palace.

Creuse. 1. Department of Central France The surface is mountainous; the area is 2,164 sq. m.; p. 277,831. Most of the male population leave the department during summer and autumn to work in Paris, Lyons, etc. 2. River of Central France; length, about 150 m. The picturesque valley has been graphically described by George Sand.

Creusot, or Kreuzot, Le, tn., France, owes its importance and rise to the establishment of iron works in 1837 by Messrs. Schneider; p. 38,000.

Creutz, Gustaf Philip, Count (1731-85), Swedish poet and diplomat His chief work was *Atis och Camilla* (1762), which at once made a sensation as a beautiful if somewhat artificial description of the awakening of love in youthful hearts. While in Paris he formed a friendship with Benjamin Franklin, with whom he concluded a treaty of commerce between Sweden and the U. S. in 1783.

Creuzer, Georg Friedrich (1771-1858), German philologist. His most famous work, the *Symbolik und Mythologie der alten Völker, besonders der Griechen* (1810-12), in which he asserts that Homer and Hesiod derived their mythology from an Eastern source through the Pelasgians, was vehemently attacked by philologists. Another important production was an edition of Plotinus (3 vols., 1835) in conjunction with Moser. See his *Life* by Starck (1875), and autobiography in *Aus dem Leben eines alten Professors* (1837-47).

Crew, Henry (1859), American physicist and educator, published *Elements of Physics* (1899), *A Laboratory Manual of Physics* (1902), and numerous papers in scientific periodicals.

Crews, munic. bor. and railway centre in Cheshire, England, with miles of tunnels under the city to facilitate rail traffic; p. 44,970.

Cribbage, a game of cards, usually played by 2 persons, with a pack of 52 cards, which rank king (highest), queen, knave, ten

(which all count as 10 in scoring), down to the ace (lowest), and a cribbage-board with four pegs, two to each player, to score with. The game is 61 points. The players cut for deal, and the non-dealer is entitled to score three holes, called 'three for last' or 'three for non-crib.' Five cards are dealt to each player, the remainder of the pack being placed face downwards on the table. The players then put two cards each on the table, face downwards—'laying out' or 'dis-carding' this is called; these four cards form the 'crib' and belong to the dealer. After this the non-dealer cuts the pack, and the dealer turns up the top card of the lower portion. This top card is called the 'start' or 'turn up' or 'crib card,' and if it be a knave the dealer scores 'two for his heels,' as it is called. In playing, the cards are held in the player's hand, and successively laid upon the table, face upwards, each hand in front of the owner. The non-dealer begins, and calls out the value of each card as he plays it, if it be a picture card, he calls 'ten.' The next player calls out the sum of the pips on the two cards played, and so on, until each has exhausted his hand, or until neither can play without passing 31, in which case the play of those hands is at an end. The object of the play is to make pairs, fifteens, sequences, or the go. 'Pairs' are two cards of the same denomination, and count two in playing or in hand. 'Pairs-royal' are three similar cards, and count 6. 'Double pairs-royal' are four similar cards, and count 12. 'Fifteens' accrue when any combination of two or more cards, in play or in hand, makes 15: and 8 and a 7, or a 2 and 5 and a 3 and an ace and a 4, count two points. 'Sequences' are three or more successive cards—such as a 5, an ace, a 4, a 3, a 2—and score as many points as there are cards in the sequence. The 'go' counts one, and is scored by the player who comes nearest to 31 during the play. It counts two when 31 is exactly reached. After play hands are shown and counted. The combination in hands or crib, which belongs to the dealer, are, besides fifteens, pairs, and sequences, flushes and nobs. 'Flushes' arise when all the cards in hand are of the same suit, one being reckoned for each card, and another added when the 'start' is also of that suit. 'Nobs' accrue to the player who holds the knave of the suit turned up, for which he scores one for his nob. The rules vary for 3 or 4 players.

Crichton, James (1560-85), known as the 'Admirable,' born in Scotland; educated at St. Andrews, thereafter leaving Scotland for the

Continent (1577) After two years in the army of Henry III. of France, Crichton proceeded to Italy, and at Genoa (1579) delivered before the senate an elaborate Latin oration, printed by order of the authorities. Going on to Venice (1580), Crichton challenged all scholars to learned disputations, the challenger claiming to be not only a scholar, poet, and linguist, but an expert swordsman. Tradition has it that he met his death at Mantua (1585), treacherously slain by the son of the duke. Popular Italian superstition urged that the calamities befalling the house of Gonzaga were divine judgments for this foul murder. The epithet 'Admirable' was first applied to Crichton by John Johnston in his *Heroes Scoti* (1603), but Sir Thomas Urquhart gave wider publicity to it in his *Discovery of a Most Exquisite Jewel* (1652). See *Life of the Admirable Crichton*, by P. F. Tytler (1819); Harrison Ainsworth's novel, *Crichton* (1837).

Cricket. Modern cricket has been developed from an ancient game of which rude pictorial delineations have been handed down from the 12th and 13th centuries. The game is contested on double wickets by two sides each containing eleven members. Upon a level sward of turf two wickets are pitched, opposite and parallel to each other, and 22 yards apart. Each wicket consists of three stumps, driven into the earth, and surmounted by a pair of bails. The area of the wicket is 27 in. by 8 in. The ball is made of cork covered with leather; its circumference must be from 9 to 9¼ in., and its weight 5½ to 5¾ oz. The bat must not exceed 38 in. in length, nor span more than 4¼ in. in its widest part. Each side elects a captain, and these toss for innings, the winner deciding whether his side shall bat or field first. The batting side sends a player to each wicket to bat. The fielding side distributes itself over the ground at certain positions, and one of its number, the bowler, stationed at the opposite wicket, tries with the ball to hit the wicket which the batsmen defends with his bat. The latter also endeavors to make 'runs'—that is, to strike the ball to a sufficient distance, and in such a way, past the fieldsmen, whose aim it is to stop it, as to enable himself and his partner to cross the distance between the two wickets, exchanging ends of the pitch, and reaching a mark, known as the 'popping crease,' within which they are safe, before the wicket is put down by the ball, returned by the fieldsmen for that pur-

pose. These runs are known as the 'score,' and the side which scores most runs wins the match. After delivering four, five, or six balls from one wicket, the bowler gives way to another bowler, who delivers a similar number from the opposite wicket, and each series of deliveries is known as an 'over.' A batsman may be out in a variety of ways, and as soon as one is disposed of another takes his place, until ten batsmen are out, when the eleventh man ('not out') has to retire, and the 'out' or fielding side goes in, their opponents taking their places in the field.

It is important to play with a straight bat, and to meet the ball with the centre of the bat. In making runs there are many well-defined strokes, classified as 'on' and 'off' drives; 'forward,' 'square,' or 'late' cuts; 'square' or 'long' leg hits, glides or glances; draws, pulls, and hooks. The ball must be driven so as to touch the ground before any fielder can catch it; for if it is caught straight from the bat, the batsman is out. There are nine ways of dismissing a batsman—bowled, caught, stumped, leg before wicket ('l.b.w.'), out by hitting his own wicket, run out, and ruled out for hitting the ball twice (except to guard his own wicket), for obstructing a fieldsmen, or for handling the ball. The fielding side can assist their opponents' score in four ways—by their bowler delivering a 'wide' (or ball which is out of the batsman's reach), a 'no-ball' (or ball improperly delivered, either because it is thrown or jerked instead of bowled, or because it is not delivered from the proper spot behind the bowling crease), by allowing a run from a ball which has not been struck by the batsman, called a 'bye,' or by a fieldsmen stopping a ball other than with his hand or person, which entails a fine of five runs.

Bowling is generally classified by its pace, as fast, medium, or slow. The first requirement of bowling is accuracy; the second 'length,' or the ability to pitch a ball at that distance from the opponent's wicket which makes it most difficult to play. After accuracy and length, in importance come 'break' and 'spin,' which are produced by an artificial twist given to the ball at the moment of its leaving the hand. The result is that the ball deviates from its original course or speed directly it touches the ground. In what is called the 'leg-break,' it turns to the left in its course; in the 'off-break,' to the right. Spin either accelerates or slackens the speed of the ball as it leaves the ground. The chief art of

of a bowler is strategy—the delivery of every ball with an object, and constant variation of method with each delivery.

The fieldsmen are stationed at various positions, each having its particular name. Their duties are to stop the ball when it has been struck, and return it sharply to the wicket, so as to prevent the batsman from getting runs; and, if it is hit into the air, to catch it, and thus terminate his innings. The most important position is that of wicket keeper, who stands behind the wicket to stop those balls which the batsman fails to strike. With each over the fieldsmen change their places in the field; they also vary their positions with different bowlers and batsmen, as directed by captain or bowler.

There are two umpires and two scorers in every match. The former take their places on the field, one at each wicket, and are the sole judges of fair and unfair play, and all disputes are settled by them. The scorers keep a record of the runs made and the balls bowled; these records are subsequently subjected to analysis. Cricket has never taken a strong hold in the United States although it is played in the larger cities of the North to some extent. Consult Spalding's *Official Cricket Guide*; B. F. Warner's *The Book of Cricket* (1911).

Cricket Frog, a small frog of terrestrial habits, it measures from $\frac{5}{8}$ to $1\frac{1}{4}$ inches in length. Its coloration is protective, usually some shade of brown, with markings. The most striking characteristics are the long, pointed head; rough, warty skin; cricket-like song; and its remarkable activity.

Crickets (*Gryllidæ*), a family of insects belonging to the order Orthoptera, and nearly allied to the green grasshoppers. The head is somewhat rounded; the feelers (antennæ) long and slender; the wings closely folded lengthwise, and oftentimes, along with the wing covers, degenerate; the hind legs long, and adapted for leaping. Near the tip of the abdomen are two long, flexible appendages of velvety texture, and in the females of most species there is a long exerted ovipositor. Definite organs of hearing are located on the front legs. In the male each of the wing covers is provided with a stridulating file on its lower aspect, by means of which the characteristic chirping call of the insect is produced. The females are fertilized by means of peculiar spermatophores, and there is no marked metamorphosis in the life history.

The House Cricket is fond of warmth, and usually inhabits the ground floors of dwell-

ings, especially bakeries, where it conceals itself around fireplaces or chimneys and under baseboards. It remains quiet during the day, but hunts about actively at night for crumbs and other scraps of animal and vegetable food. The common black Field Cricket frequently enters houses and accommodates itself to domesticity as well as the true house cricket. Tree Crickets comprise several species of small pale-colored insects and are found in trees and shrubs.

Crile, George Washington (1864-1943), American surgeon, professor of clinical surgery, Western Reserve University, joint founder of the Cleveland Clinic Hospital. He has published numerous works, some of the later ones being *Anaemia and Resuscitation* (1914); *The Origin and Nature of the Emotions* (1915); *A Physical Interpretation of Shock* (1921); *A Bi-polar Theory of Living Processes* (1924); and joint author of *Diagnosis and Treatment of the Diseases of the Thyroid Gland* (1931).

Crillon, Louis Balbis de Berton de (1541-1615), French soldier, surnamed 'Le Brave,' was trained for war, and while still a boy was distinguished for his conduct at the siege of Calais, and at the capture of Guines. He further distinguished himself in other battles. He protested against the Massacre of St. Bartholomew; was faithful to Henry III. in his struggle with the Catholic League (1580-9). When the peace with Savoy was concluded, Crillon retired to Avignon where he died.

Crime, in law, the commission or omission of an act specifically forbidden or enjoined by enacted laws. Since not all offences can be defined exactly, the principle has been adopted that a crime is any act injurious to the state of society generally, the remedy for which is the punishment of the offender. A civil injury or wrong, on the other hand, though it may likewise be detrimental to the public interest, is redressed by way of compensation made by the wrong doer to the individual sufferer. Thus, while it is undoubtedly as much a matter of general concern that persons should fulfill their contracts as that they should refrain from committing theft, yet breach of contract is now almost universally held to be merely a civil injury, whereas theft is a crime.

The law of each country must determine whether it is more advantageous that a certain wrongful act should be placed in the criminal or the civil category. It is hardly correct to say that a crime is a public wrong,

while a civil injury is a private wrong. Some wrongs which are directly against the state—a refusal to pay taxes—are civil, not criminal; while crimes may be either directly against the state, as treason, or may attack primarily private interests, as housebreaking, and only indirectly affect the state as responsible for the protection of individual rights.

The fact that a certain act is declared a crime does not prevent its being the ground for civil liability also.

In modern times the tendency is to impose the main responsibility for instituting criminal proceedings on a public prosecutor or attorney, but this is by no means essential. In order that an act may be a ground of criminal liability, certain things are necessary: 1. The guilty person must be possessed of a certain amount of intelligence, so as to be capable of distinguishing between right and wrong. 2. The act must be accompanied by a certain degree of consciousness. Thus acts done by a somnambulist cannot be punished. Intoxication is, however, no excuse, because every person is responsible for the results of a condition brought on by his own acts. 3. The act must have been voluntary, that is to say, not the result of compulsion on the part of others. There are, however, strict limits to this doctrine. At common law a crime not amounting to murder or treason, committed by a wife in the presence of her husband, is presumed to have been done under his compulsion until the contrary is proved. 4. The act charged must be accompanied with intention or culpable negligence, and accidental occurrences can never be visited with punishment. 5. The act must not have been committed out of lawful necessity, as where a man kills another who is attempting to kill him, or where a woman kills a would-be ravisher, or where a lesser evil is done in order to avert a greater.

Crime in the United States. The increase in crime in this country, which is out of all proportion to the growth of population, has led to the development of a new penology which not only studies the criminal law and practise and the prison methods but goes back of all these measures into an attempted appraisal of the causes of crime with a view to its prevention. The following figures illustrate the need of such measures: the nation's annual crime bill is estimated at 13 billions of dollars; every year in the United States about 12,000 persons are murdered, 3,000 are kidnaped, 100,000 are assaulted, 50,000 robbed, and 40,000 burglarized. In general, it is

agreed that, beside the sudden crimes of passion and impulse, about 400,000 persons make their living by crime. Confronted by such figures, those responsible for the trial, conviction, detention, and release of criminals are seeking always newer and better methods and laws.

Following the Lindbergh and other spectacular instances of kidnaping, Congress passed in 1933 an act making kidnaping a Federal offense, punishable by long terms of imprisonment. This so-called 'Lindbergh law' has been supplemented by laws of varying severity in different States.

The Senate Committee appointed in 1934 to further the work of the Department of Justice by conducting investigations and introducing new bills into Congress, consisted of Senators Copeland, Vanderberg, and Murphy, with the able assistance of Assistant Attorney-General Joseph B. Keenan. Bills introduced by them tend to facilitate the co-operation of the forces of the federal government with the states.

The major crimes here considered were bank robbery, murder, racketeering and kidnaping. It is recognized that while the detection and suppression of crime must remain for the most part a state or local obligation, the 'roving criminal' introduces an element which no local unit can meet alone. With him federal forces can deal more efficiently because of their greater mobility, their unified organization, and their freedom from local and personal entanglements. The rapid apprehension and conviction of criminals involved in kidnaping testifies to the wisdom of these measures. Meanwhile the American Bar Association has launched a widespread inquiry into the legal difficulties which tend to delay or obstruct justice. In the effort to protect the rights of every American citizen and assume his innocence until he is proved guilty, complications have developed which tend to throw too many legal defenses around the criminal. A striking example is the use of the insanity plea in murder trials, which are likely to become a battle of alienists with the issues too technical for a jury to understand or appraise.

In a recent survey by an Illinois Crime Commission, the statement was made that out of 12,543 persons actually arrested and charged with major crimes in Chicago, only 2,449 were eventually convicted. New York City's court efficiency was reckoned in a recent year by a New York Crime Commission at only 25%. All forces are now work-

ing towards more rapid administration of justice through a clearing from the schedules of the upper courts of minor cases which could be handled in other ways.

Several other problems are much discussed in this connection. The death penalty has been under fire, notably with a hearing called in New York by Governor Lehman, at which much testimony was given on both sides. Following it, he refused to make changes in present rulings. Another question much before the public is that of parole. As Sanford Bates, Director of the Bureau of Prisons in the Department of Justice, recently pointed out, a single year sees not only 66,013 admissions to Federal prisons, but also 61,653 dismissals. From 92-95% of all prisoners return to society after their prison term. The parole system provides for a period of careful supervision following their release. It is now well established in the penal practise of the Federal government and of the more progressive States, including New York. Constant vigilance must, however, be exercised to prevent its unwise use or abuse. Regulation of the sale of firearms is another subject now before the public. The United States leads the world in the number of homicides, according to periodic surveys by Dr. Frederick Hoffman, well-known statistician. Moreover, in 66 cases out of 100, the American uses a gun in his slayings, in contrast, for instance, to a very small proportion of killings by gun in England and Wales. Yet it has always been a cherished American tradition that a citizen may be able freely or under a permit system to carry a gun. Heads of police departments have appealed again and again for Federal regulation of sale and possession of firearms, but with little result. The New York Sullivan law is strict in requiring a permit to carry or possess a pistol or revolver. Yet the law is evaded by gangsters who establish residence outside the city limits or in neighboring states. Again, American manufacturers of machine guns have coöperated with the government in keeping their wares from gangsters; but foreign dealers have stepped in and met the demand as was evidenced in the type of gun found to have been used in the Urschel kidnapping. Back of the scattered instances of lawlessness lie the wealth, the power, and the extremely efficient organization of the underworld. During the period of prohibition a large part of this wealth was accumulated chiefly by bootlegging. An instance is the case of the notorious gangster, 'Al' Capone.

A product of New York slums, trained in the World War in machine-gun technique, he moved to Chicago at the dawn of prohibition and there engaged in all the familiar 'rackets.' The profits of the Capone gang were reputed to exceed \$75,000 a year. According to government investigators Capone himself accumulated in a term of years at least twenty million dollars. Coming in this connection within the reach of Federal agents, he served a term at Atlanta prison for income tax evasion, the only proved misdemeanor in a long list of probable crimes of which he was suspected.

Here are illustrated the power of the gangster and his group, and the use of money. Gangsters are equipped with the latest inventions of science—machine guns, radio, the armored car, and every other offensive and defensive device—while local police departments labor along with inadequate and antiquated equipment. The public is slowly awakening to the fact that it must rouse itself to compete with organized gangsterism. That it is doing so is evidenced by many signs, among which are the apprehension and capture of a score or more of notorious criminals in the middle 1930's, the use of tear gas in raids on fortified dens of vice as a means of protecting the lives of the police from sharpshooters, and such determined war against gambling as the 1934 drive in New York City against the slot machine.

Slot-machine gambling has been reckoned as one of the largest and most lucrative nation-wide rackets, its profits running into millions of dollars a week. Resolved to lessen if they could not entirely stamp out this evil which was exacting in pennies and small sums a total of \$25,000,000 a year in New York City, Mayor LaGuardia and his Police Commissioner gave the police department thirty days to clear the city of these machines. The results showed the effectiveness of such a concerted move. But here again the forces of law and order were hindered by technicalities. It was decided by the courts that the police must establish in every case of seizure that the machine was used for gambling, not simply for vending. Two interesting sidelines developed from this drive. The street railways, which lose thousands of dollars each year from the use of 'slugs' in their fare-boxes, found the supply diminished when the public could no longer obtain them for their use to 'play' the slot machine. Mayor LaGuardia also staged a clever bit of publicity by setting up at the Rockefeller Center a

demonstration of the various types of slot machines rounded up in the drive. Visitors were furnished free 'slugs' and urged to play the machine. With constant use, one machine paid back a 'pool' at the end of 2,845 plays, another after 2,674, illustrating as no theoretic figures by statisticians could have done the extremely slim chance of any paying player to get back a return. In Oklahoma and several other states the laws are clear which declare these machines to be gambling devices and thus make their seizure by the police an easy matter. Following the New York drive, other states followed in placing similar laws on their statute books.

Another subject which is of perennial interest is the treatment of juvenile delinquency. This follows on the compilation of figures which show the youth of those apprehended for serious crimes. Going to the source of the evil, a study of the family shows bad conditions surrounding the youthful offender. In a survey made in the 1930's by the sociology department of the University of Pittsburgh, it was discovered that fifty per cent. of the children brought into court for theft, property destruction, and immorality came from the homes broken by divorce. Yet only eighteen per cent. of Pittsburgh homes were so disrupted. See DIVORCE.

The problem of delinquency and crime is even more serious in wartime than it is in peacetime. Isolated reports from scattered localities showed an increase in juvenile delinquency in defence boom towns and around military cantonments in 1943. But at the same time there was a fairly consistent decrease in the prison population throughout the U. S., due undoubtedly to the wartime demand for manpower and the operation of the Selective Service System. See CHILDREN, DELINQUENT, CHILDREN'S COURTS.

For further study of this entire subject, see PROHIBITION, REPEAL, DIVORCE, KIDNAPING, LYNCHING, etc.; see also such books as *Crime, Its Causes and Treatment*, Clarence Darrow. See CRIMINAL LAW; CRIMINOLOGY; also the following articles:

Abduction	Capital Punishment
Appeal	Defamation
Arrest	Embezzlement
Arson	Forcible Entry
Assault	Forgery
Bigamy	Fraud
Biasphemy	Homicide
Bribery	Judgment
Burglary	Jury

Kidnapping	Prisons
Larceny	Punishment
Libel	Rape
Maintenance	Riot
Malicious Injury	Robbery
Malicious Prosecution	Seduction
Manslaughter	Slander
Misdemeanor	Tort
Murder	Treason
Perjury	Trial
Piracy	

Consult MacDonald's *Criminology* containing extensive bibliography of all phases of crime; C. Lombroso's *Crime, Its Causes and Remedies* (1911); Barnes and Teeters. *New Horizons in Criminology* (1943).

Crimea, since 1920 an autonomous Soviet Republic lying between the Black Sea and the Sea of Azov, and joined to the mainland by the Isthmus of Perekop. It measures about 200 miles from e. to w., and 125 miles from n. to s.; total area, 14,910 square miles. The northern and larger portion of the peninsula consists of flat, treeless steppes, cold and damp in winter, and oppressively hot in summer. The southern part is highland and the climate is healthful. The narrow belt of coastland s. of the Yaila Mountains was formerly a much frequented resort of Russian society, sometimes known as the Russian Riviera.

The steppes of the Crimea furnish excellent pasturage for great herds of cattle. Bee keeping is an important industry, and honey and wax are among the chief products. In the s. tobacco, mulberries, eastern poppies, saffron, plantain trees, and fig trees are cultivated. On the upper slopes grow fine woods of pines, oaks, and beeches. Large quantities of salt are obtained from the lakes and marshes of the steppes, and marbles and porphyries are found. On the seacoast near Kerch there are productive fisheries. Manufactures include flour, leather, wool, soap, preserved fruits and vegetables, and metals. Shipbuilding is carried on and skins, leather, and wool are exported. The population numbers about 760,000, and includes Tartars, Russians, Jews, Germans, Greeks, Armenians, and Albanians. The principal towns are Simferopol, capital; p. 89,000; and Sevastopol, the chief Russian naval port and arsenal of the s.; p. 75,800.

History.—The Crimea was known to the ancients as *Chersonesus Taurica*, and as early as the sixth century B.C. was the seat of flourishing colonies of Ionian and other

Greeks. From the fifth to the end of the second century B.C. it formed the kingdom of Bosphorus. It was under the control of various peoples until in 1475 it was taken from the Mongols by the Turks. The country was incorporated in Russia in 1783. From 1854 to 1856 the Crimea was the scene of the Crimean War. Following the Russian revolution of 1917 Crimea became a Republic.

Crimea Conference. See **United States Conferences.**

Crimean War, the conflict of 1853-6 between Russia on the one side, and Turkey, France, England, and Sardinia on the other, so called because it was waged chiefly in the Crimea. Louis Napoleon of France had appealed to the Sultan of Turkey for the restoration to the Latin monks of the custody of the 'holy places in Palestine,' which had been taken over by Greek monks. The Tsar of Russia, as traditional champion of the Greek Church, demanded that its monks be left undisturbed. The Sultan refused the Tsar's demands and Russian troops were despatched to the principalities of Moldavia and Wallachia. The Western Powers attempted mediation, but without success, and on Oct. 23, 1853, war was declared on Russia by Turkey. France and England came to the latter's support, and also declared war on Russia (March 28, 1854). Early in 1855 Sardinia joined the alliance, and sent a contingent to the war.

In the spring of 1854 a powerful British and French fleet appeared in the Gulf of Finland, and the Russian fleet retired behind the forts of Kronstadt and Sveaborg. Of the battles during the war, two are most celebrated. The *Battle of Balaklava* was a cavalry engagement, made memorable by the charge of the Light Brigade, which has been immortalized by Tennyson. The *Battle of Inkerman*, known as the 'Soldiers' Battle,' took place on a dark autumn morning, wherein 8,000 British sustained a hand-to-hand conflict with nearly 50,000 Russians, until the French came and routed the enemy.

The prodigious extent and strength of the fortifications of Sevastopol, together with the skill and obstinacy of its defence, protracted the siege for nearly a twelvemonth, during which the besiegers suffered incredible hardships. The terrible sufferings of the soldiers were in part mitigated by the labors of Florence Nightingale to whom the organization of proper nursing in military hospitals was due. The war ended with the fall of Sevastopol. In March, 1856, the treaty of

peace was signed at Paris. See **PARIS, TREATIES OF.** Consult Sir E. Hamley's *The War in the Crimea*; Cook's *Short Life of Florence Nightingale* (1925).

Criminal Courts. See **COURTS.**

Criminal Law is that branch of jurisprudence which deals with the punishment and prevention of crime. The criminal law of the United States is mainly derived from the common law, though from the earliest period of English history the latter has been modified and expanded by statute. But even where the criminal law has been completely recast and codified by legislation—as is the case in several of the States—it is still in great part and in all of its essential features the common law of England and the United States.

The general criminal jurisdiction in this country resides in the several States for all ordinary crimes committed within their respective borders, and is exclusive of the jurisdiction of the Federal courts. The crimes cognizable by the latter are treason, piracy and other offences against the law of nations, criminal offences committed in the District of Columbia, in the Territories and dependencies of the United States and on the high seas, and other acts described as crimes by act of Congress in matters committed to that body by the Constitution. Among the last named may be enumerated the counterfeiting of securities and coin of the United States, fraudulent naturalization and bankruptcy, violation of the postal laws, kidnaping, national bank robberies, and the transportation of stolen property from one State to another.

Criminal procedure in the United States, though generally regulated by statute, follows closely in all important respects the procedure of the common law. For misdemeanors there is a summary process, generally administered by police magistrates. In all cases of felony the accused is entitled to indictment by a grand jury, and in all criminal prosecutions to a speedy and public trial by an impartial jury of the State or district in which the crime was committed (see **CONSTITUTION OF THE U. S., Amendments v, vi.**). The provisions governing procedure in the Federal courts are reproduced in the constitutions of the several States, and govern the procedure in the State courts. The accused is further protected by the provision that no person shall 'be subject for the same offence to be twice put in jeopardy of life or limb, nor shall be compelled in any criminal case to be

a witness against himself, nor be deprived of life, liberty, or property without due process of law' (Amendment v. of the Constitution); and by the amendment providing that 'excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishment inflicted' (Amendment VIII.). See CRIME; CRIMINOLOGY.

Consult Blackstone's *Commentaries* (Vol. iv.); Bishop's *New Criminal Law*; Archbold's *Pleading, Evidence, and Practice in Criminal Cases*; Harris' *Principles of Criminal Law*; M. Parmelee's *Anthropology and Sociology in Relation to Criminal Procedure* (1908); Gabriel Tarde's *Penal Philosophy* (Eng. trans 1912)

Criminology, or Criminal Anthropology, the science that includes both the study of crime and the study of the criminal. In the first sense, criminology is subordinate to sociology and ethics, and cannot very profitably be dealt with scientifically apart from these broader studies. In the second sense, criminology is a study which seeks to apply to the criminal the methods of psychology, psychiatry, and anthropology, and to investigate such physical and psychic peculiarities as he may present. The term *criminology*, though more convenient, is not so exact as *criminal anthropology*, which indicates the necessary connection with anthropology.

From the time of Aristotle, and even earlier, incidental observations have been made on the characteristics of criminals, and on the supposed associations between mental and bodily traits generally. Such observations were incorporated in the pseudo-science of *physiognomy* of which Dalla Porta and Lavater were the most able representatives. The year 1876 is momentous in the history of criminology, for in that year *Cesare Lombroso* of Turin published the first volume of his *L'Uomo Delinquente* ('Criminal Man'), and the Elmira Reformatory was established in New York under the superintendence of Z. R. Brockway. Stimulated by Darwin's *Origin of Species*, Lombroso had conceived the idea that the criminal, in marked cases, must be regarded as a special human variety or type, of largely atavistic nature, reproducing many of the traits of the savage, and at the same time showing morbid characters, especially of an epileptoid character. Thereupon he set himself to examine and measure, with a fulness and detail that had never before been attempted, a vast number of criminals, and at the same time to accumulate evidence bearing on the matter from any and every

source. Lombroso remains an inspiring pioneer in a new field. It is in Italy that the new 'positive' school of criminology chiefly had its rise—a fact partly due, no doubt, to the prevalence of crime in that country, and the frequent marked abnormality of criminals there; and Lombroso was aided in his task by a large number of investigators, often working independently. Two of these, Marro and Enrico Ferri, may especially be named. Marro's work is always cautious, patient, and original, and he is averse to all theorizing. Ferri may be regarded as more especially a sociologist, and his power of massing details harmoniously, together with his broad, philosophic, and lucid grasp of the whole problem of crime and the criminal, renders him the most capable champion of the modern science of criminology.

If we look on criminality from a scientific point of view, it may be regarded as of its essence that it shall be *anti-social*. This is an important point, because if we bear it in mind it becomes impossible to insist on the particular act of crime, when defining and classifying the varieties of criminality; for under some savage and barbarous systems of society, murder, theft—indeed, almost any act which with us is anti-social—may be genuinely social, and for the benefit of the community. Every society necessarily has its own group of anti-social acts. Our classification must have primary reference not so much to the nature of the act, as to the nature of the person committing it. On that basis the following classification, which corresponds in the main with that of Ferri, is convenient:

1. The *criminal by passion*, though his act is anti-social, is not moved by anti-social motives. Under the stimulus of insult he is prompted to an act of violence.
2. The *insane criminal* commits his offence under the influence of some definite condition of mental alienation. He is anti-social, but merely as a consequence of disease, and belongs to a special category.
3. The *instinctive* or *congenital criminal* belongs to a group which merges into that of the insane criminal, but in its typical form is distinguished by the absence of any definite form of intellectual insanity, though there is usually, and perhaps always, some degree of mental weakness or perversity. It coincides, on the whole, with the group sometimes recognized by alienists as affected by 'moral insanity.'
4. The *occasional criminal* is a more common and more normally constituted person, and his chief characteristic is weakness of character.
5. The

habitual or *professional criminal* is, for the most part, a more fully developed offender, who on the basis of his original weakness or inaptitude for social life has developed a certain skill in his anti-social avocations. In the *élite* of this group such skill may be considerable.

When we come to the treatment of criminality, very largely the question is one of social hygiene, and many writers, more especially Ferri, have argued that we are indirectly dealing with criminality when we are directly carrying out a wise system of general social legislation. It may indeed be said that, on the legal side, the individual treatment of the criminal, as against the abstract method of punishing the crime with little or no reference to the special character of the criminal, constitutes the chief practical outcome of the modern system of criminology. The establishment of the Elmira Reformatory in 1876 has already been mentioned. It is a prison for felons; its main features are the indeterminate sentence (with certain restrictions), so that release depends largely on the prisoner's own exertions, and a strenuous system of physical, moral, and intellectual training, including the acquirement of some handicraft by which the prisoner may live when he leaves the prison. The life in such a prison is by no means an easy one for the prisoner, who usually prefers the comparative idleness of other prisons; but the success of the system and its soundness are sufficiently attested by the fact that the Elmira Reformatory has become a model widely imitated throughout the United States, and studied by foreign observers.

A still further advance in the method of treating criminals has been made in some parts of the United States, notably in New York under an act of 1901. The injurious effect upon the moral character of a first offender arising from confinement in company with hardened criminals has long been recognized. Under the law mentioned, first offenders convicted of certain crimes, instead of being sent to prison, may be placed under the charge of probation officers, whose duty it is to see that the offender does not fall into evil ways. If the probation officer is unable to exercise control over the probationer, the latter may be rearrested and sentenced to prison for the offence of which he was originally convicted.

The term *mattoid* was used by Lombroso to designate a class of congenital paranoiacs. They might be called *crank criminals*, if it

were not for the abuse of the word 'crank.' However interesting may be the question of the decrease or increase of crime from year to year, the most serious fact is that so much crime *does* exist. That the criminal class, who constitute less than one per cent of the community, should be allowed to cause so much trouble and expense to the great body of law-abiding citizens, is a sad comment on man's incapacity in governing man.

Some principles of modern criminology are:

1. Degrees of criminality should be estimated according to detriment to the community.
- From this point of view, international crime or war is the greatest of all crimes
- 2 The study of criminals is mainly the study of normal men, and knowledge thus gained may be applied to the community as a whole
3. The prison and reformatory may serve as a humanitarian laboratory for the benefit of society.
4. Criminals are social bacilli, and require as thorough investigation as the bacilli of physical disease.
5. Every person dangerous to life or property, whether criminal, insane or defective, should be confined, but not necessarily punished.
6. Society has no right to permit prisoners to be released who will probably return to crime.
7. Where it is a question between justice to the individual or justice to the community, the community should have the benefit of the doubt.
8. The prison should be a reformatory, and the reformatory a school.
9. Reformatories should make the conditions as similar as possible to the surroundings outside, so that when inmates are released they may adapt themselves more easily to society.
10. One purpose of criminology is through knowledge gained by scientific study, to protect the weak, especially the young, in advance, before they have become criminals

See CRIME; CRIMINAL LAW; PRISONS; REFORMATORIES; ANTHROPOLOGY.

Bibliography.—The most famous work on criminal anthropology is Lombroso's *Criminal Man* (1876). Some recent books are Robinson's *History and Organization of Criminal Statistics in the United States* (1911); Masten's *Criminal Types* (1923); Gillin's *Criminology and Penology* (1925); Healy and Bronner's *Delinquents and Criminals* (1926).

Crimp, a person who professedly occupies himself in finding employment for seamen. His object is to get hold of the sailor and his effects; keep him by means of drink or drugs in his power until his wages are paid; and fleece him of his money, and even of his clothes.

Crinoidea, or *Sea Lilies*, a class of enchi-

modermata, differing from other members of that order in being either permanently or temporarily fixed by a stalk to rocks, stones, or the soft mud of the sea bottom. Apart from the stalk, which is usually jointed, the body consists essentially of a calyx or cup enclosing the visceral mass, and of long, branched arms radiating from this cup. The arms, though typically five in number, may be greatly multiplied by branching, they bear lateral pinnules, which produce the characteristic feathered appearance. Both arms and pinnules are provided with ciliated grooves, down which the food—protozoa, diatoms, small crustacea, etc.—is conveyed to the mouth. As in most echinoderms, there are numerous limy plates forming the stalk, the supporting cup, the framework of the arms, and other parts.

Living sea lilies were formerly supposed to be few in number; but explorations in the deep sea have shown that they exist in large numbers—some 400 species, distributed among 12 genera, having been discovered. The Rosy Feather Star, which is the best-known modern form, breaks away from the stem at a certain stage, retaining only a stump of the stalk.

Crinoline, a term derived from the Latin *crinis* ('hair'), was originally given by French modistes to a stiffening fabric of horse hair, employed to extend women's skirts; and it was also applied to structures of steel wire or hoops by which the same effect was obtained. More recently, the term has been applied to a cotton gauze stiffened with glue.

Cripple Creek, tn., Colo., near Pike's Peak, at an altitude of 9,800 ft. The Cripple Creek gold region is one of the most productive in the world; p. 2,358.

Cripps, Sir Richard Stafford (1889-), British statesman; member of Parliament 1931- ; left-wing member of the British Labor Party, from which he was expelled for being 'over-sympathetic with Moscow', but later reinstated. He was with the Red Cross in France, 1914; ambassador to Soviet Russia, 1940; in 1942 given the difficult mission of going to India and trying to solve the Indian problem, but he failed. Was transferred from his position as leader of the House War Cabinet to the post of Minister of Aircraft Production, 1942; President of Board of Trade in the Attlee Labor Cabinet, 1945- .

Crises, Economic, occur during times of commercial difficulty, when the pressure be-

comes acute in consequence of a collapse of credit and of public confidence. The best approach to an understanding of the deeper causes of crises is that of human relationships formed in our efforts to gain a livelihood. As life grows increasingly complex its delicate adjustments are easily thrown out of balance. What appears on the surface is generally not a fundamental cause, but a surface manifestation of causes. Surpluses of many kinds had been accumulating; there was a lack of balance in economic life and the relationship between consumer and producer had been thrown out of adjustment.

One of the chief causes of crises is human psychology, men expect the impossible and act on feeling and emotion. The land boom in Florida which lasted for several years and culminated about 1926, was not based on actualities. Land was sold at prices that could not be based on any possible income that the land could produce. Inflated values always precede a crisis; all goes well so long as the illusion continues, and when that fails, the collapse is inevitable. Stagnation and a slow period of recovery follow. One generation may learn the lesson, but a new generation appears and again over-expansion based on high price continues until another crash, then depression, and another slow recovery. Booms and their aftermaths stand first as causes; closely connected with these are wars and their consequences.

Numerous crises have fallen in the United States under our modern civilization of the steam and electricity era, and even somewhat earlier when commerce was growing in scope and significance. The following dates have been given of American crises. 1796, 1815, 1825, 1837, 1857, 1873, 1884, 1893; 1907, 1913, 1920, 1929. Each of these crises was followed by years of stagnation. It may be questioned if 1884 was not simply a continuation of the crisis of 1873. Though causes varied, we always find over-expansion in certain particulars. The stock exchange crash of 1929 was not unlike crises of the past. If one reads David Wells' excellent account of the crisis of 1873 in his book, *Recent Economic Changes* (1889), one may see the same phenomena repeating themselves. Step by step, the development is strikingly similar. Farm land values collapsed late in 1920 and continued to fall for at least a decade, accompanied by a wide-spread fall in urban land values. Over-expansion was general in production of coal, copper, textiles,

etc. Public utilities had a remarkable growth and a far sounder one than the development of the railways two generations earlier.

On the stock exchange, however, people lost their reasoning faculties; stocks, like real estate, sold at prices that could not reasonably be expected to yield as much as money put in the savings bank. Transactions were based on illusions, and the resulting crash was one of the worst in American history.

In recent years able economists have given much attention to business cycles. They divide economic life into cycles of prosperity, recession, recovery and prosperity, and within these cycles crises find their place as acute disturbances. The subject of business cycles is one of the most complex and difficult problems in economics, and the interest in it is shown by the fact that a recent bibliographical list of titles numbered nearly a thousand. See W. C. Mitchell, *Business Cycles*.

Consult D. R. Dewey, *Financial History of the United States*; R. T. Ely, *Outlines of Economics*, Ch. 17; W. C. Mitchell, *Business Cycles*; Adams, *Economics of Business Cycles* (1935).

Crispi, Francesco (1819-1901), Italian statesman, prominent as revolutionist, deputy, president of the chamber, minister, and premier. Charges of financial irregularities were brought against him. He was forced out of office but an attempted impeachment failed. See Stillman's *F. Crispi, Insurgent, Exile, Revolutionist, and Statesman* (1899); L. Fortis's *Crispi, Note Biografiche* (1895).

Crispin or Crespin, tutelary saint and patron of shoemakers, was traditionally born at Rome towards the close of the 3d century, and maintained himself by working as a shoemaker while spreading the gospel. The tale is, however, probably apocryphal. His festival falls on October 25. See *St. Crispin and the Gentle Craft* (1868).

Crissa, Crisa, or Cirrha, tn. of Phocis, ancient Greece. The inhabitants of Crissa levied dues on the pilgrims to the oracle at Delphi, and claimed to control the oracle; the first sacred war was waged against them, in about 590 B.C., with the result that Crissa was utterly destroyed, and its territory declared sacred to Apollo.

Cristobal, Panama Canal Zone, American port at northern end of canal, adjoining Colon, Panama. See COLON and PANAMA CANAL.

Critias, politician at Athens at the close of the 5th century B.C., and a pupil of Socrates, became leader of the Thirty Tyrants es-

tablished by the Spartans. In this position, he showed the greatest severity towards the supporters of the democracy. Critias had some reputation as an orator and a poet; the fragments of his poetry will be found in Bergk's *Poetae Lyrici Graeci*. He also wrote a work on politics, which has been identified with the *Treatise on the Athenian Constitution* included among the writings of Xenophon. Plato makes him the chief speaker in his dialogue *Critias*.

Critical Temperature. Andrews of Belfast, working with the substance known as carbon dioxide, showed that when the temperature was below 31° C. the vapor and liquid conditions could be clearly distinguished, and could exist in presence of each other; but that at temperatures above 31° C. no amount of pressure could produce a true liquid condition, a state characterized by the appearance of a free liquid surface. The substance might be compressed to a density less than that in a liquid condition at lower temperatures, but it was impossible to mark any transition from the gas to the liquid form such as is familiar to us in the ordinary case of steam and water.

This temperature above which no condensation to a liquid form can be effected, Andrews called the critical temperature. It is a definite temperature, associated with a definite pressure for every substance. Not until we reduce the temperature of the particular substance below its critical temperature can we effect its liquefaction.

Criticism, Biblical. The higher criticism (so-called in contrast to the 'lower' or textual) is not so much concerned with the text of a document as with its origin and character—its integrity, its authenticity, its credibility; though, of course, the two fields of inquiry cannot be kept wholly distinct. As regards integrity, the critic may come upon omissions, interpolations, or transpositions. The question of authenticity is complicated by the fact that in certain periods of the past the fabrication of works professing to be written by distinguished authors was so common as almost to be called a profession: Plato, Epicurus, etc., were credited with books they never saw. The problem of credibility is naturally a very involved one, and it demands acquaintance with the laws of historical evidence, and skill in the application of them.

For a long time the writings of the Bible were considered to lie outside the domain of criticism; but the modern textual criticism

of the New Testament followed by that of the Old Testament, having in some measure unfixed the popular idea of the inviolability of the Scripture texts, prepared the way for the more fundamental and more far-reaching investigations of the higher criticism. The conclusions drawn, indeed, have led many to look upon the higher criticism as an enemy to the belief in an inspired Bible. But since it is admitted by all thinking men that we do not possess the Scriptures in their original form, it is difficult to see why an embargo should be laid upon investigations designed to get as near as possible to the autographs, since the criticism of the Scriptures presupposes their inspiration, seeing that its main purpose is to ascertain the circumstances of their authorship, and on the basis of the resultant facts, to portray the development of the religion of the chosen people, or, as it might be put, to exhibit the process of the Divine revelation to man.

The higher critic and the lower critic alike must, of course, have an extensive knowledge of the language of the documents they investigate; they will also require a certain indefinable insight and tact; moreover, if it be the Biblical writings that are under investigation, we have a right to demand great sobriety of mind, and (especially in the higher critic) a responsiveness to religious ideas. The methods and results of the higher criticism will be found in books of introduction, and usually in commentaries. The science of literary-historical criticism is usually treated in theological encyclopædias. For textual criticism, see Rishnell's *Higher Criticism* (1893); Zeno's *Elements of Higher Criticism* (1895); and Gilmore's 'Higher Criticism' in *Monist* (Jan., 1904).

Criticism, Literary. Criticism may be said to be established in Aristotle's *Poetics*, a treatise which has had an overwhelming influence, and remains the greatest single pronouncement in the whole history of criticism. The greater part of the *Poetics*, which is unfortunately fragmentary, deals with tragedy—a fact which accounts for the predominance of dramatic criticism in modern times down to the 18th century; and though its views are drawn from the example merely of Greek poetry, they are indisputable in their essentials. The *Rhetoric* is a hardly less valuable treatise on prose, though not so important a contribution to the philosophy of literature. Latin criticism is best represented by Cicero, Horace and Quintilian. Unlike Greek criticism, it had another literature with which

to compare its own: but it felt the domination of Greece too strongly to avail itself properly of this advantage; and yet its influence has been considerably greater. The *Epistola ad Pisones* or *De Arts Poetica* of Horace has had more to do than any other single book with the establishment of the general doctrines of literary 'classicism.' The influence of the scholars of Alexandria and Pergamos, which was first felt in Rome about 160 B.C., may be traced down to the renaissance. The middle ages produced a large number of formal treatises on rhetoric, and scholastic expositions devoted specially to prosody and metre; but the only work before the renaissance which stands out pre-eminently as criticism, by reason of its spirit, range, and attitude, is the *De Vulgari Eloquentia* of Dante.

The very enthusiasm of the renaissance was inimical to the immediate growth of criticism. The treasures of Greece and Rome were accepted indiscriminately, and the chief care was the mere text. Criticism made little or no advance before Vida's *De Arte Poetica* (1537), the herald of the great critical activity in Italy during the 16th century. If Italy played the chief part in the development of criticism during the 16th century, the lead in the 17th passed to France. The only valuable piece of dramatic criticism at this time, and perhaps the most valuable in the whole history of French literature, is the *Discours Dramatiques* (1660) of Corneille. By far the greatest work is the *Art Poétique* (1674) of Boileau, a full statement of the general principals of French classicism, and an admirable expression of the literary spirit of the time.

The real beginnings of English criticism are to be found in the rhetorics of the 16th century, the most important of which is the *Arte of Rhetorique* (1553) of Thomas Wilson; and, like French criticism, it developed when fructified by the work of the Italians. This influence is very marked in Roger Ascham's *Scolemaster* (1570) and is no less so in the *Apologie for Poetrie* (1595) of Sir Philip Sidney, the masterpiece of Elizabethan criticism, interesting alike in its defence of poetry as an art, its classical doctrines, and its references to contemporary English literature. Frenchmen (e.g., Tolomei and Jacques de la Taille) had already done; and as late as 1602 T. Campion made a similar plea in *Observations on the Art of English Poesie*, which in turn called forth Daniel's *Defense of Ryme* (1602; Haslewood's ed. 1811). A

very different note is struck in Bacon's *Advancement of Learning* (1605), bk. ii., where he deals with the nature of poetry, and finds its source in the faculty of imagination. In Ben Jonson we have a critic of pronounced classical tastes. Jonson has called Dryden the 'father of English criticism'; and the title may be easily justified, for in Dryden criticism concerns itself with discussing methods rather than with dictating rules, judges an author or work in respect of the general characteristics, and is established as a distinct literary form. The culmination of English classical criticism is seen in Jonson, in some respects the greatest of English critics. Macaulay's remark that Jonson's attitude is that the lawyer is particularly happy, for Johnson expounds and applies his literary doctrines, and treats even his favorite authors, with the cold impartiality of the bench.

In the latter half of the 18th century attention was given to the more general problems of taste. The English school is represented by Hume's essay, *Of the Standard of Taste* (1742). The French representative is Diderot. But the study was fully established, and in a sense claimed as its own, by Germany. G. E. Lessing's *Laokoon* (1766), which is under some debt to the earlier of the English works, had a profound influence, and is the forerunner of the work of Schiller, Kant, Richter, Schelling, Fichte, and Hegel. But their doctrines belong rather to the domain of æsthetics than to that of literary criticism, though they told greatly on the practice of literary criticism at a time when the romantic revival threw the old methods and theories into the melting-pot under the ægis of classicism. Of the *Poetics* of Aristotle, Lessing had said, 'I do not hesitate to acknowledge that I consider this work as infallible as the *Elements* of Euclid;' but in pointing out the errors in the superstructures of the French critics, he helped on the overthrow of classicism itself.

The advent of romantic criticism in England was announced by the preface of the *Lyrical Ballads* (1798) of Wordsworth and Coleridge. The two great critics of the new school are Coleridge and Hazlitt. The revolution in aim and manner is brought out admirably by a statement in the *Biographia Literaria* (1817) of the former: 'Critics are too apt to forget that rules are but means to an end; consequently, where the ends are different, the rules must be likewise so. We must have ascertained what the end is before

we can determine what the rules ought to be.' The addition of historical sympathy to the interpretative and catholic attributes of the new school was urged by Carlyle, who, however, has left little purely literary criticism.

Of the other champions of the new school, the more important are Lamb, Leigh Hunt, and De Quincey. But though critics of delicate taste, they hardly affected the theories or principles of criticism; and still less did Macaulay, whose work is reactionary. In the latter half of the 19th century the greatest force in English criticism was Matthew Arnold. Important is the attention he devotes to foreign literatures, which has led to the development of comparative criticism. It would be difficult to gauge the influence of Ruskin, but it is seen to best effect in the interpretative criticism, with its doctrines of æsthetic enjoyment of Walter Pater.

The searching of hearts caused by Poe's audacious criticisms of his contemporaries in this country was no doubt of the greatest use in the development of American literature. Lowell, of course, was the comparative critic *par excellence*, on whom the best of his successors have modeled their styles with variations of their own.

Modern French criticism begins with Madame de Staël's *La Littérature* (1800) and *L'Allemagne* (1810), and Chateaubriand's *Génie du Christianisme* (1802). The former broke down the barriers of the old classical criticism by examining the influence of religion and 'social institutions,' and urging the study of the Teutonic literatures. She is well said to have enlarged the sphere of French criticism in point of space. Chateaubriand, on the other hand enlarged it in point of time, for he helped to create an interest in ages before the period of classical ascendancy. Madame de Staël, in particular, prepared the way for the romantic movement in the third decade. The stimulus for the development of critical method came from the Sorbonne, and the form it took was the introduction of history into criticism. Victor Cousin applied history to the interpretation of philosophy, and expressed views on the influence of climate and surroundings which were to be fully developed by Taine; while Villemain, marked a further advance by showing the interaction or parallel development of different literatures and bringing both history and biography to bear in the illustration of an author's work.

The scientific purpose is fully developed in Taine. In his theory the essential character

of a literature is established by three conditions—the *race*, the *milieu*, and the *moment*—of which every author is regarded as a resultant. A further scientific development is seen in the evolutionary theories of M. Brunetière, who holds that, after the influence of the individual, the greatest is that of works on works. He is unsurpassed in tracing a literary influence or tendency; but his insistence on the evolutionary method has dwarfed his faculty of appreciating a work in itself.

Only recently has the development of literary criticism been recognized as a definite study, Professor Saintsbury's *History of Criticism and Literary Taste in Europe* being the principal attempt at an adequate treatment of the subject. With the greater attention now paid to the study of literature, greater demands are made on the critic's scholarship; but the development of research and 'laboratory work,' in which the Germans have for long been the most assiduous, is not without danger to the generalizing power which, in his own way, the critic must possess no less than must the poet. At the same time, increased attention is apparently being paid to the technical and formal. On the whole, criticism is now descriptive rather than interpretative, and is more occupied in disengaging an author's qualities than in judging them. If it compares one author with another, its purpose is not to prove one the better—as in the old disputes over Homer and Virgil, Ariosto and Tasso, Corneille and Racine—but rather to illustrate the different methods, manners, and points of view. Perhaps its best work is in placing the author in relation to the general tendencies of the time, and in analyzing and tracing the main movements in the literary life, whether individual or national.

See Pope's *Essay on Criticism*; B. Bosanquet's *A History of Aesthetic* (1891); S. H. Butcher's *Aristotle's Theory of Poetry and Fine Arts* (1902); J. E. Spingarn's *Literary Criticism in the Renaissance* (1899); G. Gregory Smith's *Elizabethan Critical Essays* (1897); Stedman's *The Nature and Elements of Poetry* (1892); W. M. Payne's *American Literary Criticism* (1904); C. M. Gayley and F. N. Scott's *Methods and Materials of Literary Criticism* (1899), a useful bibliography; Richard's *Principles of Literary Criticism* (1924).

Critolaus, of Phaselis in Lycia, Greek philosopher of the Peripatetic school. He was sent by the Athenians to Rome in 155 B.C.,

with Carneades and Diogenes, to obtain the remission of a heavy fine imposed on the Athenians, and with his colleagues made a great impression at Rome by his lectures.

Crittenden, John Jordan (1787-1863), American political leader, was born in Ky. He held various offices including the governorship of Kentucky. He is best remembered for his loyalty to the Union at the time of the Civil War, and his efforts to prevent war. In 1860 he allied himself with the Constitutional Union Party and after the election of Lincoln proposed in the U. S. Senate the famous Crittenden Compromise. During the war he supported the Administration in the main, but was identified with the conservative rather than with the radical element in Congress. Consult Coleman's *Life of John J. Crittenden*.

Crittenden, Thomas Leonidas (1815-93), American soldier, son of John Jordan Crittenden, served during the Mexican War, and after the war was appointed consul at Liverpool by President Taylor. In the Civil War he served on the Federal side; in 1867 was brevetted brigadier-general for gallant and meritorious conduct.

Crittenden Compromise, a measure for compromise between the Northern and Southern States of the United States proposed in the U. S. Senate by John J. Crittenden on Dec. 18, 1860, when the outbreak of hostilities between the two sections seemed imminent. It provided for the adoption of six amendments to the Federal Constitution, the most important of which was that the line of 36° 30' N. lat. should divide slave from free territory, so long as such territory should remain under territorial government, but that 'when any territory north or south of said line . . . shall contain the population requisite for a member of Congress . . . it shall, if its form of government be republican, be admitted into the Union, on an equal footing with the original States, with or without slavery as the constitution of such new State may provide.'

In addition to the amendments the Crittenden Compromise contained a proposed resolution calling upon Congress to do all in its power (in certain specified ways) to promote the return of fugitive slaves. The compromise scheme was rejected in the Senate, Mar. 2, 1861. The text is given in Macdonald's *Select Documents Illustrative of United States History*, 1776-1861.

Crivelli, Carlo (1430 to after 1493), Venetian painter, was influenced by Vivarini and

the Paduan school, and lived remote from any contemporary art movement. His treatment is realistic; his architectural perspective and firmness of line remarkable; his color rich and clear; his finish elaborate. England is rich in his pictures, including his masterpiece, *The Virgin in Ecstasy*—and there are a number in America.

Croaghpatrick, mountain (2,510 ft.), Ireland. St. Patrick is said to have commenced his missionary work here, and it is consequently visited by many pilgrims. Splendid panoramic views are obtained from its summit.

Croatia-Slavonia, a district of Yugoslavia since 1918, was formerly an Austro-Hungarian state, subject to Hungary from 1868 until the World War. The people are mostly Southern Slavs (Croats, Serbs, and Slovenes) and are of the Orthodox and Roman Catholic faith.

Croatia-Slavonia, having formed successively part of Pannonia, Illyria, and the Western (Roman) Empire, was colonized by the Croats towards the middle of the 7th century, and about 910 became an independent kingdom. It was subject to Hungary from 1091 to 1526; a period of more or less complete Turkish occupation followed, and Austria acquired control at the beginning of the 18th century. From 1777 to 1868 Croatia-Slavonia was alternately connected with and separated from Hungary, restoration taking place in the latter year.

The middle of the 19th century saw the development of a strong nationalist feeling among the Croats. This received a new impulse with the Austrian occupation of Bosnia and Herzegovina in 1878, and agitation continued intermittently until in 1918, at the close of the World War, Croatia-Slavonia became a part of Yugoslavia. Croatia became a puppet nation and officially declared war on the Allies, 1941.

Croce, Benedetto (1866-), Italian scholar. In 1920-21 he was minister of education. Croce's political liberalism, strongly manifest in his *Story of Italy* (1927), was unsympathetic to Fascism, but he continued to live in Italy and his theories of esthetics and logic brought him recognition as a major European thinker. A mob sacked his library in Naples in 1926. The influence of Hegel, Fichte and Goethe were apparent in his works and he strongly opposed Marxian materialism. The American Academy of Arts and Letters made Croce an honorary member in 1934. His works, which have had great in-

fluence on literary history and philosophy, include: *Estetica* (1902); *Logica* (1905); *Filosofia della pratica* (1908); *Problemi di estetica* (1910); *La rivoluzione napoletana del 1799* (3rd ed. 1912); *La letteratura della Nuova Italia* (1914-15); *Conversazioni critiche* (1918); *Nuovi Saggi di estetica* (1920); *Storia di Europa nel secolo decimonono* (1932). Consult his Autobiography (tr. 1927).

Crochet Work (*Fr. crochet*, 'a hook'), work in wool or cotton thread with a hooked needle according to certain patterns. A delicate crochet lace is manufactured at Clones, Ireland.

Crocidolite, a mineral consisting of quartz in which are enclosed parallel fibres of a blue, yellow, or brown color.

Crocker Land, a supposed land in the Arctic regions n.w. of Cape Thomas Hubbard, reported by Peary in 1906, but proved by MacMillan, in his expedition of 1914, to be a mirage.

Crocket, a floriated ornament applied to the copes, capitals, cornices, and gables of churches and buildings of the Early English period.

Crockett, David (1786-1836), American pioneer, was born in Tenn. He received little education, but early became schooled in all the arts of the backwoodsman. In the Creek War he commanded a battalion of mounted riflemen under Gen. Andrew Jackson. He was a Jacksonian Democrat in the National House of Representatives, in which his eccentricities of manner and speech attracted national attention, and his independence led to a breach with his autocratic party chief. He subsequently took part in the Texan war for independence, and was killed in the Alamo, Mar. 6, 1836. His motto, 'Be sure you are right, then go ahead,' is often quoted. An autobiography, attributed to Crockett, was published in 1834. Consult also *Lives*, by Abbott and by Ellis and by Constance Rourke (1934).

Crocodile, a member of the reptilian subclass Crocodilia, which includes also the alligators and gavials together with a number of extinct forms. In all living crocodilians two pairs of limbs are present, the tail is long, the quadrate bone of the skull is fixed, and the teeth, which are confined to the upper and lower jaws, are separately planted in sockets. All are encased in a strong armor of bony scales, with external scales due to the epidermis. The heart is four-chambered as in birds and mammals but owing to the

arrangement of the blood-vessels the great arteries contain mixed, not pure blood, so that the circulation is of the same type as in other reptiles.

Unlike that of the alligator, the crocodile's upper jaw moves while the lower is fixed. The true crocodile occurs in Africa, the southern part of Asia, and extends southward to tropical Australia. It reappears on the opposite side of the world in Central America, the West Indies, and the northern part of South America, where it encroaches on the territory of the alligator. In habit, recent crocodilians closely resemble one another, being actively carnivorous animals at home in the water, from which they do not stray far except when compelled by drought to migrate. The female crocodile lays numerous eggs in a pit excavated on a sandy shore, and appears to visit the nest regularly till hatching takes place. The young pipe within the shell as unhatched chicks do, and there appears to be little doubt that the mother hears the sound, and digs out her offspring, which she conducts to the water.

Crocodile River. River. S. Africa; rises in Transvaal, and flows n.e. until it joins the Komati on the border of Portuguese territory. See LIMPOPO.

Crocus, a genus of hardy cormous plants belonging to the order Iridæ. They have upright, cup-shaped flowers, spreading 6-perianth segments wide in sunlight. Even in the 17th century Parkinson described as many as thirty-one kinds. *C. imperati*, found wild near Naples, is one of the earliest species to flower, as it is also one of the most beautiful. The parents of most of the Dutch crocuses are two species which grow wild in S. E. Europe, *C. Moesiacus* and *C. vernus*.

Croesus, son of Alyattes, king of Lydia from 560 to 546 B.C. He extended the kingdom of Lydia over all Asia Minor as far east as the river Halys, also establishing his power over the Greek colonies in Asia. Finally he declared war on Cyrus, king of Persia, the oracle having assured him that if he crossed the Halys he would destroy a great empire. But the empire to be destroyed was his own; he was utterly defeated, and Sardis, his capital, was taken (546).

Croftut, William Augustus (1835-1915). Croftut served in the Civil War on the Union side. From 1888 to 1894 he was executive officer of the U. S. Geological Survey. Among his books are *The History of Connecticut in the Rebellion* (1867), and *The Vanderbilts* (1886).

Croft, Sir Herbert (1751-1816), English author; vicar of Prittlewell, Essex (1786-1816); because of debts retired to the Continent (1802), and died at Paris. He wrote *Memoir of Young* for Johnson's *Lives of the Poets* (1779), etc. See Nichol's *Literary Anecdotes* (1812-15).

Croft, William (?1677-1727). English organist and composer, is remembered chiefly by his sacred music, most of which took the form of anthems composed for state ceremonies. He was organist of Westminster Abbey (1708).

Crofter. The origin of the class of small tenants known as crofters, and of the crofter question, was the transformation in the middle of the 18th century of the clan chief into the landlord, partly as the result of the abolition of heritable jurisdictions in 1746, and partly of general economic causes. The change made the relation between the landlord and the tenant purely a business relation, but it deprived the tenant of his customary rights, which practically amounted to co-proprietorship. In the change the co-proprietary rights of the former clansman were not sufficiently regarded and he became simply a tenant-at-will of a landlord who ceased to pay much regard to the person of his tenant. The crofter question specifically arose out of the agricultural depression. Failure of crops, heavy taxes and other causes contributed to create so widespread a distress and consequent agitation that a royal commission was appointed in 1883; and their report was made the basis of legislation, in particular of the Crofters' Holdings Act of 1886, the chief provisions of which are security of tenure, fair rents, compensation for improvements, and a right to claim an enlargement of holding.

There are three classes included under the name 'crofter'—those occupying land in separate tenancy, really small farmers, and known as independent crofters; those occupying arable land in separate tenancy but pasture in joint tenancy, known as township crofters; and cottars, who are usually squatters, and exist chiefly by fishing and casual employment. The second class, the township crofter, is the real crofter. See Duke of Argyll's *Scotland as It Was and as It Is* (1887); Shaw-Lefevre's *Agrarian Land Tenures Report of the Royal Commission*, 1883-4 (1884).

Crofts, Ernest (1847-1911), English painter. His works include *The Morning of*

the *Battle of Waterloo* (1876) and other paintings of military subjects.

Croker, John Wilson (1780-1857), British statesman and man of letters, born in Galway. In 1809 he published *The Battle of Talavera*, and the same year was appointed secretary to the Admiralty, an office which he filled ably for twenty years. He wrote *The Battles of Albuera* in 1811, and about the same time began his long connection with the *Quarterly Review*, first as contributor and afterward as editor. In 1831 appeared his edition of Boswell's *Life of Johnson*, which was mercilessly attacked by Macaulay, his bitter enemy. Croker was happier in his services to historical literature when he edited Lord Hervey's *Memoirs* (1848), the *Suffolk Papers* (1824), Walpole's *Letters to Lord Hertford* (1824), and translated several foreign works, the best known perhaps being Bassompierre's *Embassy to England*. Disraeli drew a most unflattering portrait of him as Rigby in *Coningsby*, but Sir Theodore Martin takes a different view in the *Dict. of Nat. Biog*. See the *Croker Papers*, with *Correspondence and Diaries*, edited by L. J. Jennings (3 vols. 1884).

Croker, Richard (1843-1922), American politician, was born at Black Rock, Ireland, and was brought as a child to New York. He rose from the position of a district leader of Tammany Hall to be chairman of its finance committee and undisputed 'boss,' and gave a final demonstration of his power in the election of Robert A. Van Wyck as the first mayor of Greater New York in 1897. He retired from politics in 1902, and made his home at first in England and afterward in Ireland, where he devoted himself to horsebreeding and racing.

Croker, Thomas Crofton (1798-1854), Irish antiquary, born at Cork, served in the Admiralty till 1850. Croker is known by *The Fairy Legends and Traditions of the South of Ireland* (1825), which greatly delighted Scott (new ed. 1902), *Daniel O'Rourke* (1828) etc. See *Memoir* by his son, T. F. Dillon Croker, in *Fairy Legends* (1859).

Croll, James (1821-90), Scottish scientist, born in Coupar-Angus, Perthshire, was self-taught. His most important work, *Climate and Time* (1875), gave rise to much hostile criticism, to which, in 1885, he replied in his *Climate and Cosmology*. His life was written by Campbell Irons in 1896.

Croly, George (1780-1860), British author, who settled in London (1810), where for twenty-five years he devoted himself en-

tirely to literature, but afterward became rector of St. Stephen's, Walbrook, where he gained a great reputation for his eloquence. Croly's chief novel was *Salathiel* (1829), reprinted in New York as *Tarry Thou till I Come* (1901).

Croly, Jane Cunningham ('Jennie June') (1831-1901), American author, was born in England. She was brought to New York when ten years old and was married to David G. Croly in 1856. In 1860 assumed the editorship of *Demorest's Mirror of Fashion*, afterward *Demorest's Illustrated Monthly*, and held this position for twenty-seven years. Mrs. Croly invented the system of duplicate newspaper correspondence. She founded the woman's club, 'Sorosis,' in 1868, and was its president for many years.

Cro-Magnon Man, a race of primitive white men who settled in Europe probably during a temperate interval in the Ice Age about 20,000 years ago, and following Neanderthal man, who either died out or was exterminated at that time. The first evidence of the Cro-Magnon type was four skeletons discovered in 1868 in the Dordogne area of the Cro-Magnon Cave, near Les Eyzies, in southwest France. A joint British-American expedition in 1932 discovered extensive carvings of the Cro-Magnon period on the walls of a cave on Mount Carmel, in Palestine. Consult Sir Arthur Keith's *Antiquity of Man* (2d ed. 1925).

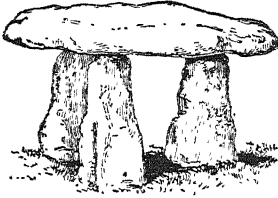
Cromarty. 1. Parliamentary burgh, spt. and par., Ross and Cromarty, Scotland, on Cromarty Firth, 19½ m. n.e. of Inverness. 2. Firth, opening into the Moray Firth, from 7¾ m. to 1 m. broad at its mouth, and forming a fine natural harbor. The islets known as the N. and S. Sutors of Cromarty are at the entrance, and are composed of Old Red Sandstone. Hugh Miller's writings have made them famous.

Crome, John (1768-1821), English landscape painter, called 'Old Crome' to distinguish him from his son John Bernay Crome (1794-1842). His vigorous work has earned for him the name of the 'English Hobbema.' In 1803 he gathered the Norwich artists together, and in 1805 the 'Norwich School' was founded. See E. Chesneau's *The English School of Painting* (1884); Redgrave's *The Century of Painting* (2d ed. 1893).

Cromer, Evelyn Baring, First Earl (1841-1917), British consul-general at Cairo, and one of the makers of modern Egypt, born at Cromer Hall, Norfolk. His connection with Egypt began in 1877, when he was

appointed English commissioner on the Egyptian debt. Under Baring's rule Egypt became transformed into a well-governed, well-administered, and prosperous country. He also saw the power of the Mahdi destroyed and the Sudan restored to civilization.

Cromlech, a Celtic word applied to certain types of ancient megalithic structures in Brittany, to a circle of standing stones; and in Wales, to three or more upright stones, closely grouped together and capped by a large horizontal stone. This latter appears



Cromlech: Lanyon Quoit near Penzance.

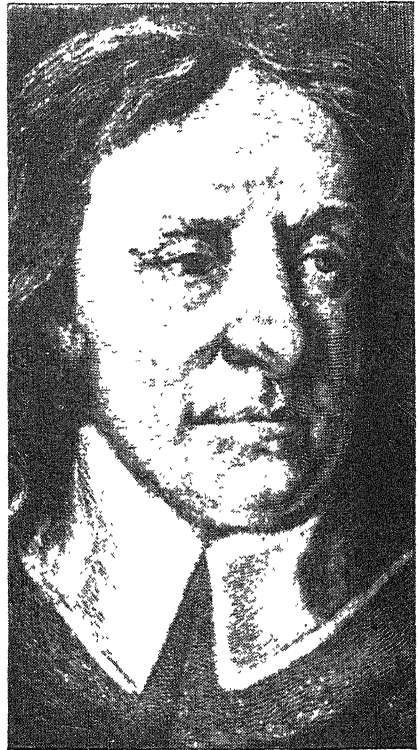
also to be the prevailing application in Ireland and in Scotland. The most plausible and probably the correct deduction is that cromlechs were 'stones of bowing' or 'worship.' The structure known in Britain as a cromlech is styled a *dolman* in Brittany, where, as already stated, cromlech denotes a stone circle.

Crompton, Samuel (1753-1827), English inventor of the spinning-mule (1779). His spinning-mule produced a yarn fit for the manufacture of fine muslins (till then chiefly imported from India), and thus practically created the British muslin trade. See French's *Life and Times of Crompton* (1859).

Cromwell, Bartlett Jefferson (1840-1917), American naval officer, born in Nebraska, studied at Annapolis in 1857-60. As commander, he accompanied Admiral Schufeldt on his voyage around the world in the *Ticonderoga*, 1879-81. He was promoted rear-admiral in 1899.

Cromwell, Oliver (1599-1658), the great Protector, born at Huntingdon, of Welsh descent. Early experiencing a 'saving change,' he emerged from his period of gloom and anxiety a stern and convinced Puritan and Calvinist, and a determined foe of Laud's absolutist pretensions in church and state. He sat as a member for Huntingdon in the Parliament of 1628. When the Scottish revolt compelled Charles to summon the Short Parliament (1640), Cromwell sat for Cambridge; and again in the Long Parliament.

He fought at Edgehill (1642), and there saw that a counter-motive was required to meet the gallant traditions inspiring the king's soldiers, and this he found in the stern godliness of the English yeoman. He organized his famous cavalry regiments from this class, and at Marston Moor (1644) dem-



Oliver Cromwell.

(From the Pastel Portrait by Cooper, Sidney Sussex College, Cambridge.)

onstrated the superiority of his troops, and stood forth as the greatest English military leader of the time—a fact which he showed again at Newbury, Naseby, Preston, Dunbar, and Worcester—though the Scots general Leslie excelled him in strategy.

The execution of the king in 1649, following the signing of his death warrant by Cromwell, shocked all the moderate men; and after Cromwell's return from a ruthless expedition against the royalists in Ireland, he was summoned to Scotland, where Charles II. had been declared king by the whole nation. The 'crowning mercy' at Worcester (1651) followed his victory over the Scots

at Dunbar, and the three kingdoms were at the feet of the victor. His first troubles were with Parliament. The 'Rump,' the remnant of the Long Parliament, being recalcitrant and determined to prolong its own existence, Cromwell summarily dissolved it. Cromwell was elected Protector, with a Parliament as a check on his authority; but he was forced to dissolve his own Parliament, and thenceforth ruled alone, relying upon the army for support. He was as great a statesman as he had been as a general, and his work in safeguarding English liberties, both civil and religious, has been permanent. But this policy was too strenuous for the people of England, and when he died, the nation returned contentedly to the rule of the Stuarts. He was one of the greatest of Englishmen, long execrated as a regicide, now revered as a hero, saint, and demigod, guilty of many mistakes, but animated by the highest ideals of religion and liberty. See Carlyle's *Cromwell's Letters and Speeches* (1845-6); F. Harrison's *Cromwell* (1888); John Morley's *Cromwell* (1900); C. H. Firth's *Oliver Cromwell* (1900); *Cromwell's Army* (1901); Roosevelt's *Oliver Cromwell* (1900), and R. B. Merriman's *Life and Letters of Thomas Cromwell*.

Cromwell, Richard (1626-1712), son of the great Protector, Oliver Cromwell; succeeded his father as Lord Protector, but inherited little except the office.

Cromwell, Thomas, Earl of Essex (1485-1540), English statesman, was the chief agent in bringing on the English reformation, and in establishing Tudor absolutism. Entering Wolsey's service as early as 1514, he was, on the whole, faithful to his master, even in his fall. To secure absolute power for Henry he made use of Parliament, by whom the Act of Supremacy was passed (1534), and he secured revenue by the suppression of the monasteries. But when his international combination of Protestants against the Emperor Charles v. broke down, he fell before the hatred of nobles and clergy, and, abandoned by Henry, was executed.

Cromwell, William Nelson, American financier and corporation lawyer, was born in N. J. As counsel for the Panama R.R. he organized the New Panama Canal Co.

Cronin, Archibald Joseph (1896-), English author, was born in Cardross, Scotland; aided by Carnegie Foundation scholarships, he became a doctor but deserted medicine for writing. He wrote *Haitter's Castle*, *The Citadel*, *The Stars Look Down*, *The Keys*

of the Kingdom, 1941; and a play *Jupiter Laughed*.

Cronje, Piet Arnoldus (1835-1911), Boer general, of Huguenot descent. In the war of 1880 he commanded a division of his countrymen at Doornkop and Majuba Hill. It was he who frustrated the Jameson raid at Krügersdorp (1895); and when the Boer War began Cronje was appointed commander of the western army of the S. African Republics. When, on Feb. 15, 1900, General French raised the Boer siege of Kimberley, Cronje retreated and at last found himself hemmed in on all sides. Generals De Wet and Botha, attempting his relief, were beaten back, but the British suffered severely. For eight days Cronje maintained the struggle, but at last, on February 27, the anniversary of Majuba, surrendered with his whole army.

Cronos, identified by the Romans with their god Saturn, in Greek mythology was the ruler of the gods before Zeus. He was the youngest of the Titans, and the son of Uranus (Heaven) and Ge (Earth); and was the father, by Rhea, of Hestia, Demeter (Ceres), Hera (Juno), Hades (Pluto), Poseidon (Neptunus), and of Zeus (Jupiter). He expelled his father Uranus from the throne of heaven, and was in his turn dispossessed by Zeus.

Cronstadt, Russia. See **Kronstadt**.

Crook, George (1828-90), American soldier, was born near Dayton, O. He commanded the Federal forces in West Virginia for some time in 1864, and for a time in 1865, was in command of the cavalry of the Army of the Potomac. After the war he became well known as an Indian fighter in the West and in 1886 commanded the United States forces during most of the campaign against Geronimo. He became a major-general (April, 1888), and in 1888-90 was in command of the Department of the Missouri.

Crookes, Sir William (1832-1919), English scientist, was born in London. In 1861 he discovered the metal thallium, and in 1872 began a series of researches into radiant matter with the aid of a radiometer, an instrument invented by himself (1873-6). He founded the *Chemical News* in 1859, and became editor of the *Quarterly Journal of Science* in 1864. One of his most important inventions was the Crookes tube. In recognition of his discoveries, he received a prize of 3,000 francs and a gold medal from the French Academy of Sciences (1880) and in

1907 shared the Nobel prize in chemistry with Buchner. He was an expert in matters of water-supply and sanitary questions, and also an authority in electrical matters. His publications include *Select Methods in Chemical Analysis* (3d ed., 1894); *The Wheat Problem* (1899).

Crookes Tube. See **Vacuum Tubes.**

Crop, in various animal species a name given to a dilatation of the anterior part of the gullet, having for its object the storing of food. When present, it is usually followed by a gizzard or grinding region, and the crop then acts like the hopper of a mill. In the bee-hive, the crop is the bag in which the insects carry food back to the hive.

Crops, Farm, a term used collectively to indicate the produce or harvest of cultivated land. The leading staple crops of the United States are corn, hay, cotton, wheat, oats, potatoes, barley, tobacco, sugar-cane and sugar-beets, rice, rye, flaxseed, and buckwheat. The term crop also includes various fruit and market-garden products. For accounts of these various crops see the articles treating of them individually. See also **AGRICULTURE**.

Cropsey, Jasper Francis (1823-1900), American painter, was born in Rossville, Staten Island, N. Y. From 1847 to 1863 he passed much time abroad in study and painting. He became a member of the National Academy in 1851. Among his paintings are *Pontine Marshes*, *Backwoods of America*, *Sunset at Lake George*.

Croquet, a lawn game, in which the players drive wooden balls, by means of long-handled mallets, through a series of hoops. The game seems to be substantially a revival of the old game of Pall Mall, which gave its name to what is now the well known London street. Croquet (Fr. *croquer*, 'to crack') became a popular game about 1850. A *croquet ground* should be a well-rolled level grass lawn, not less than 30 yards long by 20 yards wide. A later development of the game is called **ROQUE**.

Crosby, Ernest Howard (1856-1907), American author and reformer, was born in New York City. He was a member of the New York assembly in 1887-89; judge of the International Court, Alexandria, Egypt, in 1889-94, and subsequently a promoter of social reforms. His works include *Swords and Plowshares* (1902), *Tolstoy and His Message* (1904), *Labor and Neighbor* (1907).

Crosby, Frances Jane (1820-1915), America hymn writer, was born in South East, Putnam co., N. Y., and became blind

at the age of six weeks. She early developed a faculty for writing songs and hymns, many of which gained wide popularity in Moody and Sankey's collections. Her hymns include 'Safe in the Arms of Jesus', and 'I am Thine, O Lord.'

Crosby, Howard (1826-91), American clergyman, was born in New York City. He was chancellor of New York University from 1870 to 1881, and was the leading promotor of the New York Society for the Prevention of Crime. His published works include *The Lands of the Moslems* (1851); *Jesus: His Life and Works* (1870).

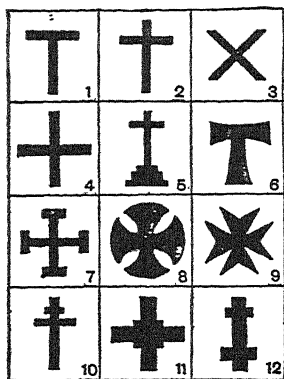
Crosby, John Schuyler (1839-1914), American soldier, was born in Albany co., N. Y. was brevetted major for carrying the first despatches from the Red River to Far-ragut. In 1876 he was appointed United States consul to Florence, Italy and was governor of the Territory of Montana (1882-4), in that capacity helping to secure the Yellowstone Park for the use of the nation.

Crosier, properly an archbishop's staff terminating in a floriated cross, but also applied to a bishop's staff terminating in a crook. Its origin is the shepherd's crook, symbolical of the duties of a pastor or leader of a flock. In the Roman Catholic Church it is carried before bishops or abbots when they are exercising priestly functions. See **PASTORAL STAFF**.

Crosman, Henrietta (1870-1944), American actress, was born in Wheeling, W. Va. She played with Daly's and the Frohman's companies and in 1897 she was married to Maurice Campbell. The next year she began to appear as a star. One of her most successful parts was that of the title character in *Mistress Nell*. She has also played acceptably Shakespearean rôles.

Cross (Lat. *crux*), the intersection of two stakes at right angles, commonly used amongst the dominant peoples before the Christian era as an instrument of punishment and death; hence the symbol implies suffering and loss. Among the Romans the practice of capital punishment by means of the cross continued until the 4th century, when Constantine the Great abolished it. With the triumph of Christianity the cross became a symbol of dignity and honor. Among the Carthaginians and Phœnicians it was used as an instrument of sacrifice to Baal. The Persians believed it to be a charm against evil and death, and to the Gauls it was a solar symbol endowed with creative and fructifying power. In Central and South

America the natives worshipped it as the emblem of the god of rain. When to the upright stake, the original form of the cross or gibbet, a horizontal beam was added across the top, it formed the *crua commissa*. More often the beam was fixed at a lower level, the *crua immissa*, the form used at the crucifixion of Christ.



Various Forms of Cross

1. *Crua Commissa* or ansata; the Egyptian cross (or St. Anthony's). 2. *Crua immissa* or capitata; Latin cross. 3. *Crua decussata*, saltire or St. Andrew's. 4. Greek cross. 5. Calvary. 6. Tau or St. Anthony's. 7. Jerusalem cross or potent. 8. Formy. 9. Maltese or St. John's of Jerusalem. 10. Patriarchal cross. 11. Lowy quadrant. 12. Lorraine cross.

The true cross of Christ is recorded to have been discovered by the Empress Helena near the scene of our Lord's sufferings (A.D. 326). Part of it was deposited in a chest by Constantine, where it is still preserved at Rome; and other portions were distributed throughout Christendom. In ecclesiastical architecture the cross was the plan upon which the grandest churches were erected, the walls carrying upward the cruciform sign, the spire pointing upward in the sacred figure.

Various spiritual fraternities take their name and ensign from the cross. St. George's cross, incorporated with St. Andrew's cross, blend their form and color in the British Union Jack; and by international agreement the Geneva red cross on a white ground safeguards the medical corps on the field of battle. Among the variations of the cross, those found in upright architecture form a distinct class. The sanctuary cross is usually an obelisk of beautiful sculptural design. The boundary and monumental crosses belong to the pre-Reformation period. The runic crosses of ancient Scandinavian workmanship

found in the border counties of England and Wales are elaborated representations of the hammer of the god Thor. The Celtic crosses of the 12th and 13th centuries, found in the monasteries and convents of Ireland; the beautiful St. Martin's cross, Iona, and the famous Eleanor or Norman crosses were either religious or commemorative. The Scott Monument, Edinburgh, is an example of the Norman cross on a gigantic scale.

The crosses were originally erected as a sort of pulpit from which preachers spoke; they were erected also to commemorate signal events. The famous Paul's Cross (near St. Paul's, London) was destroyed by the Puritans in 1643, it was erected in the reign of Henry III. in 1259, and was the scene of many religious and historical events.

In heraldry the cross is one of the ordinaries or principal charges. There are supposed to be more than a hundred varieties of the cross blazoned in heraldry, each bearing a different signification. See *HERALDRY*.

The practice of affixing a person's signature to a document, when that person is unable to write, by making his mark, X, is said to date from as far back as the 6th century. The Southern Cross is the name of a great constellation in the Southern hemisphere. Several varieties of coin have been named from pictures of the cross engraved on them. See A. Rimmer's *The Ancient Stone Crosses of England* (1875); Ashton and Baring-Gould's *Legendary History of the Cross* (1887).

Cross, Charles Robert (1848-1921), American physicist born Troy, N. Y. In 1882 he established at the Mass. Institute of Technology the first course in electrical engineering in the U. S., remaining in charge of it until 1902. His investigations in electricity and acoustics have been printed in the publications of learned societies.

Cross, Marian. See *Eliot, George*.

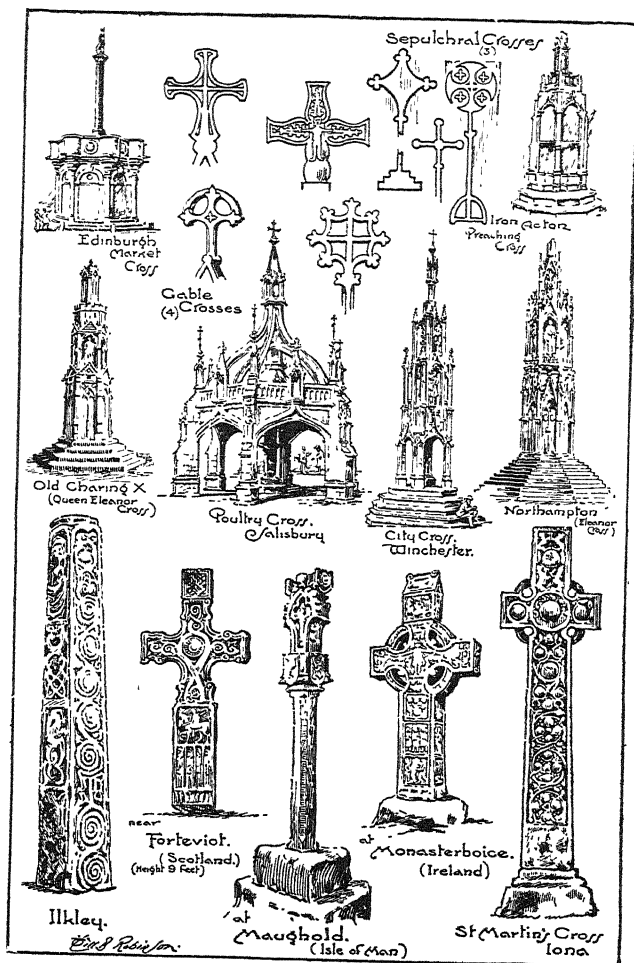
Cross, Richard Assheton Cross, 1st Viscount (1823-1914), English politician, born near Preston. His legislative record in the House of Commons, where he had a seat from 1857 to 1886, includes the Artisans' Dwellings Act (1875), the Factory and Workshops Act (1878), and the Housing of the Working Classes Bill (1885).

Cross, Wilbur Lucius (1862-), American educator and English scholar, was born at Mansfield, Conn. He was professor of English at the Sheffield Scientific School at Yale from 1902-21; Dean of the Yale Graduate School from 1916-30 and governor of Connecticut 1931-39. He edited editions of

Macbeth (1900), *Ivanhoe* (1903), etc. and was editor of the department of English literature in the *New International Encyclopedia* (1901-4). He also published a careful brochure on *The Development of the English Novel* (1899).

Crossbills, a genus (*Curvirostra*) of large

was superseded by the less cumbersome long-bow. The bow was stretched either by hand or by some mechanical contrivance. The missiles, which were either arrows or bolts, varied considerably in size and shape, but generally consisted of a winged wooden shaft tipped with metal. See the exhaustive mono-



Memorial and Monumental Crosses.

finches inhabiting the coniferous forests of Northern Europe and America, and characterized by the fact that the mandibles pass, or 'cross,' one another at the tips. One species, the white-winged crossbill, is frequently seen in the Northern United States in winter.

Crossbow, or **Arbalest**, a weapon in use chiefly in the 12th century, after which it

graph. *The Crossbow*, by Sir R. Payne-Gallwey (1903).

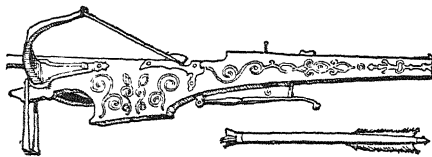
Cross-examination. See **Evidence**.

Crosshead. The crosshead of an engine is a block fixed at the end of the piston rod, and working in parallel guides, to take up the thrust caused by the obliquity of the connecting rod, and to cause the end of the

piston rod to move in a straight line. Cross-heads are usually of cast iron.

Cross Keys, a village in Rockingham co., Va. Here on June 8, 1862, during the Civil War, an indecisive battle was fought between about 8,000 Confederates, forming part of 'Stonewall' Jackson's army, under Gen. Ewell, and about 18,000 Federals under Gen. Frémont.

Crossopterygii, an order of fishes, defined by the presence of lobate paired fins, with a



Crossbow and Quarrel.

thick axis, and rays placed on either side of this axis. The Crossopterygians are ganoid fishes, and include the living *Protopterus* of Africa, together with numerous fossil forms.

Crotalus, the genus to which the rattlesnake belongs.

Crotch, William (1775-1847), English musical composer, born at Norwich; manifested in childhood a marvellous musical precocity. He became professor of music at Oxford (1797), and in 1822 first principal of the Royal Academy of Music, London. He composed largely, but excelled in anthems and oratorios. One of the best of the latter is *Palestine* (1812), based on Herbert's poem. He also wrote *Elements of Musical Composition* (1812).

Crothers, Samuel McChord (1857-1927), American clergyman, essayist, born at Oswego, Ill. As a Unitarian clergyman he was in charge of the First Parish in Cambridge, Mass. from 1894 until his death. His works include *Members of One Body* (1894), *The Gentle Reader*, *The Understanding Heart* (1903).

Croton, a large genus of tropical shrubs and trees, some species of which are of economic importance. The seeds of *Croton Tiglium*, an E. Indian tree, are the source of the irritant, croton oil and croton liniment of pharmacy, and of a very drastic and powerful purgative. The cascarilla of pharmacy, which is used as a stimulant tonic, is the bark of *Croton eleuteria*, a W. Indian shrub. Cascarilla bark is the most important constituent of fumigating pastilles.

Croton, a Greek colony founded by set-

tlers from Achæa in 710 B.C., in the territory of Bruttium in S. Italy. It became very wealthy and prosperous, but in the next two centuries its power decreased, and eventually it became incorporated in the Roman empire. It was famous for its school of medicine, and also as the birthplace of the athlete Milo, and as the residence of Pythagoras. Its modern name is Cotrona.

Croton Aqueduct. See **Aqueducts**.

Croton Bug. See **Cockroach**.

Croton Oil, an oil obtained by expression from the seeds of *Croton Tiglium*, a small tree native to India and the more easterly tropical parts of Asia. In doses of not more than a drop it acts as a drastic purgative; in larger doses it is externally a powerful irritant, and internally a violent poison.

Croton River, tributary of the Hudson River, about 60 miles in length, rises in Dutchess county, New York, and joins the Hudson 30 miles north of New York City. Its basin for many years afforded the chief water supply of New York City. See **AQUEDUCTS**; **DAMS**.

Croup, an inflammatory condition of the larynx, which may also extend to the trachea, bronchi, and bronchioles, and is characterized by a loud and 'metallic' or 'brassy' cough. Inflammation of the larynx may, of course, occur at any age; but the peculiar development called croup is almost exclusively confined to young children, mostly between the ages of two and seven. The disease may be either membranous (diphtheritic) or non-membranous (false croup). (See **DIPHTHERIA**).

The physician aims at securing a subsidence of the swelling and an expulsion of the membrane, when present. In the early stages an emetic of ipecacuanha wine is often useful. The air the patient breathes should be kept moist and warm. Inhalations of oxygen are of some use in lessening the respiratory effort. Diphtheria antitoxine is the most logical treatment for diphtheritic croup, and as it acts admirably in croup, as well as in diphtheria, it should be tried in all suitable cases.

There is also a form of 'false' croup due to a spasmodic contraction of the glottis, which exists quite apart from any inflammation. See **DIPHTHERIA**.

Crow (*Corvus*), a genus of large passerine birds of the family *Corvidæ*, including some 200 species found throughout the world, with the exception of New Zealand. Crows are

highly intelligent, and are regarded by many naturalists as the highest of the birds. Among the many species are the Raven—*Corvus Corax*; the Jackdaw—*C. monedula*; the common American crow (*C. Americanus*), which is well known for its thievish habits, especially in the corn field.

Crow (Indian *Absároka*, 'bird people' or 'crow'), an Indian tribe of the Siouan stock, divided into two groups: the Mountain Crows, who dwell in the mountainous districts of the Missouri River Valley, and the River Crows who reside along the banks of the river.

Crow Blackbird. See **Grackle.**

Crowder, Enoch Herbert (1859-1932), American army officer, was born in Edinburgh, Mo. He served with the Eighth Cavalry in the Indian campaign (1886) which resulted in the capture of the famous Geronimo, and in the campaign (1890-91) against the Sioux in the Dakotas. General Crowder served on the General Staff from 1903 to 1907, and during that period was sent as U. S. military observer on General Kuroki's staff in the Russo-Japanese War (1904-05). In 1911 he was made Judge Advocate General with the rank of Brigadier-General, the highest position in the legal department of the Army. Following the entrance of the United States into the Great War he was appointed Provost Marshal General four days after the signing of the Selective Service Act, which he himself drafted, and in that capacity was responsible for the operation of the machinery of the selective draft in the United States (see CONSCRIPTION; EUROPE, GREAT WAR OF).

Crowe, Sir Joseph Archer (1825-96), English writer on art, was born in London and spent many years on the Continent, being closely associated with the Italian critic, Cavalcaselle, with whom he wrote *History of Painting in Italy* (1868), and *Early Flemish Painters* (1879). Consult his *Reminiscences* (1895).

Crowell, John Franklin (1857-1931), American economist, was born in York, Pa. He was president of Trinity College, North Carolina (1887-94), and head of the department of Economics and Sociology in Smith College (1895-7). He was connected with the U. S. Industrial Commission and with the Treasury Department as an expert on internal commerce, and was executive officer of the New York Chamber of Commerce (1916-17). His numerous publications on social and economic subjects include *The Logical*

Process of Social Development (1898); *Social Insurance with Special Reference to Health Insurance* (1917).

Crowfoot. See **Ranunculaceæ; Ranunculus.**

Crown, the name of various coins; according to Murray, originally a translation of the French *couronne*, *denier à la couronne*, the name given to a gold coin bearing on the obverse a large crown, issued by Philip VI. of Valois in 1339; or applied to the *écu de la couronne* of Charles VI. in 1384. The crown in English coinage was introduced by Henry VIII., and was composed of both gold and silver, bearing a crowned rose and a crowned shield of arms. The present English crown is equivalent to 5 shillings.

Crown, a term used in Great Britain to denote the sovereign in his corporate as opposed to his individual capacity (see CORPORATION), though as popularly and loosely used it may signify the executive government in any of its departments much in the same way as 'the people' or 'the state' does in the United States.

The chief prerogatives of the crown as now exercised are to dissolve and convoke Parliament, to dismiss and to select ministers, to declare war and make treaties, to create peers, and appoint bishops, colonial governors, and judges. The king can veto any bill of Parliament by refusing his assent; but this power has not been exercised since 1707.

The death of the king is technically known as the *demise of the crown*. The King's title is, 'By the grace of God, of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the seas King, Defender of the Faith, Emperor of India.' There are extensive lands and hereditary revenues attaching to the crown; but for many years it has been the custom for the sovereign to surrender them to the nation in consideration of an annual payment called the civil list. The king is, *ex officio*, supreme head of the Established Church of England, and of the orders of knighthood. He sits in the Privy Council, but does not, and could not properly, sit in the cabinet. Consult Dicey's *Law of the Constitution* (6th ed. 1902).

Crown, in architectural construction, sometimes means a crown tower, but more generally the upper portion of a cornice, including its members or the top or meeting place of the sides of an arch.

Crown, a special headdress designed as a symbol of royalty or distinction. Alexander the Great wore the first Greek royal crown as

a symbol of rank. In Rome the crown was regulated in its form and splendor by the fancy of the wearer. In Egypt, royal crowns, often very elaborate, were in common use. The crowns of the Ptolemies were distinguished by their simplicity. In Greece the archon wore a crown as an emblem of rank. The inter-Hellenic games in Greece brought into vogue the famous garlands of which Homer speaks. There was the 'crown of thorns' at Calvary. In Rome the crowns of distinction are varied in their use and form. Bridal crowns are still worn to this day in Norway. The royal crown of England has passed through many modifications since the early days of the Anglo-Saxon princes. At the Norman Conquest it was a circle of pearls set in gold; later it was elaborated into a radiated diadem. The coronation crown of King Edward VII. was covered with jewels, and was lined with a cap of violet velvet.

Crown Colonies, British dependencies governed directly by the British crown. They are contrasted with the colonies which possess the right of self-government. See BRITISH EMPIRE.

Crowne, John (c. 1640-c. 1703), English dramatist, went to England from Nova Scotia (1660). His comedies, notably *Sir Courtly Nice*, 1685 (which held the stage for a century), were considered by many to surpass those of Dryden. His collected works, with memoir, were published in 2 vols. in 1874.

Crown Point, town, New York, in Essex County, on Lake Champlain, 110 m. north of Albany. At this point in 1731, the French put up a fortification regarded as the key to Lake Champlain. In 1759 General Amherst took possession, demolished the French fortifications and built new ones. On May 10, 1775, the fort was captured by Seth Warner while Ethan Allen and Benedict Arnold gained possession of Ticonderoga. In 1910 the grounds and ruined forts were given to the State for a public park. The States of New York and Vermont have erected a vehicular bridge across Lake Champlain near the old fort; p. 1,661.

Crown Wheel, or **Contrate Wheel**, a toothed wheel in which the teeth stand at right angles to its plane. See GEARING.

Crowther, Samuel Adjai (?1809-92), native African bishop, was born on Achugu, near Dahomey. He was captured and sold as a slave, but on reaching Sierra Leone, after the slave ship had been taken by a British frigate, attached himself to the Anglican mission. After the necessary training, he was

entrusted with a mission to his countrymen, first as a teacher, then as a clergyman, and finally as bishop of Yoruba, to which he was consecrated in 1876. As an eloquent preacher, as a translator of the Bible into Central African languages, as a compiler of valuable grammars and dictionaries, he did noble service in the cause of Christianity and civilization.

Croydon, municipal borough and market town, England, in Surrey; 10 m. south of London. It is chiefly a residential town, but is now famous as the most important airport in England and one of the best in the world. From there is direct regular service to many of the Continental capitals. The old archiepiscopal palace, said to have been founded by Lanfranc, was sold toward the end of the eighteenth century, and Addington Park was acquired in its place; p. 212,400.

Crozet Islands, a group of islands of volcanic origin in the South Indian Ocean, lying between Prince Edward Island and Kerguelen; area, about 200 sq. m. They were discovered by Marion's expedition in 1771, and belong to Great Britain. All are uninhabited. They were visited by the *Challenger* Expedition in 1873-4.

Crozier. See **Crosier**.

Crozier, Francis Rawdon Moira (c. 1796-1848), English naval captain and explorer, made three voyages to the Arctic Circle with Captain W. E. Perry (1821-7), and accompanied Captain Ross to the Antarctic Ocean in the *Terror* (1839), returning in 1843. In 1845, in the same vessel, he sailed with the Sir John Franklin Expedition, and perished in the Polar regions. See ARCTIC EXPLORATION.

Crozier, John Beattie (1849-1921), Anglo-Canadian philosopher, was born in Galt, Ontario. He settled in London, England, and received a pension from the civil list, in order to further his investigations for his *History of Intellectual Development on the Lines of Modern Evolution* (1897-1904), a work of learning and research, in which the author seeks to trace out the determining law of the development of civilization. Other books are *The Religion of the Future* (1880); *Civilization and Progress* (1885); *Sociology as Applied to Practical Politics* (1911).

Crozier, William (1855-1942), American soldier and inventor, was born in Carrollton, O. Entering the Ordnance Department in 1881, he became distinguished as an authority on all matters pertaining to ordnance. In 1888 he proceeded to Europe to study artillery, and on his return invented, with Gen.

A. R. Buffington, the Buffington-Crozier disappearing gun carriage, adopted by the U. S. Government, and other devices, including a wire-wound gun. In 1901 he was made chief of ordnance, U. S. Army, with the rank of brigadier-general. In 1912-13 he served as president of the Army War College, Washington, D. C. and during the Great War was a member of the War Council. He was appointed major general in 1918 and retired from active service that same year.

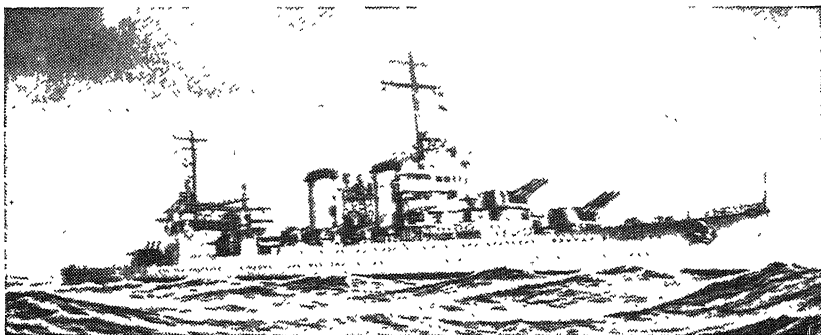
Crucian, (*Carassius vulgaris*), a fresh-water fish, nearly related to the carp, from which it differs in the absence of barbules, in the single-rowed arrangement of the pharyngeal teeth, and in a few other minor points. It is found in numerous varieties in rivers, ponds, and lakes in Europe and Asia.

damine, Dentaria, Nasturtium, Brassica, Sinapis, Erysimum, and Raphanus.

Crucifix (Latin, *crux*, 'the cross,' and *figo*, 'I fix'), a cross with the effigy of Christ fixed to it. From the fourth century they have been common in the worship of the Western Church, and in Roman churches they are found not only on the high altar, but in all the subsidiary shrines. In the earlier centuries the figure of the Christ on the cross was portrayed as clad and still in life; but later a dead Christ was usually represented, and nude, save for a waist cloth. Crucifixes are fashioned of wood, stone, or metal. See Cross.

Crucifixion. See Cross.

Cruden, Alexander (1701-70), British scholar, author of the well known Biblical Concordance, was born in Aberdeen, Scotland.



U. S. Cruiser Minneapolis.

Crucibles, open cup-shaped vessels used to contain solids that are to be strongly heated or fused. They should be themselves infusible, little liable to crack or break, and remain unacted on by their contents. For general industrial purposes these conditions are most nearly met by crucibles made of fireclay or of fireclay mixed with graphite; but if the very highest temperatures are to be withstood, lime or carbon must be employed. For analytical purposes platinum crucibles are by far the most convenient, porcelain being utilized where platinum is unsuitable.

Cruciferae, an important order of plants whose flowers have four petals placed in the form of a cross, and six stamens, of which two opposite ones are shorter than the other four. The Cruciferae include about 1,800 known species, mostly palaearctic, and especially abundant in Europe. No order is more familiar or more widely represented. Among the genera are *Draba*, *Cochlearia*, *Arabis*, *Car-*

In 1737 appeared his Complete Concordance of the Holy Scriptures, dedicated to Queen Caroline, who promised to 'remember him,' but died a few days later. During his later years he became mentally unbalanced.

Cruelty, the wilful infliction of unnecessary pain, in its legal aspects is confined chiefly to the question of divorce and to the treatment of children, the insane, and animals. As cause for divorce, cruelty includes not only physical violence, but also such conduct on the part of either husband or wife as to produce mental suffering sufficient to impair the health or defeat the legitimate ends of matrimony (see DIVORCE). Cruelty to children embraces both abuse of the child's body and corruption of its morals, and is punishable at common law as a criminal offence (see CHILDREN, CRUELTY TO).

Cruelty to Animals was first made the subject of preventive legislation in England in 1822; and in 1824 the Royal Society for

the Prevention of Cruelty to Animals was formed. Under various statutes passed in England, cruelty to domestic animals is punishable by fine and imprisonment.

In the United States, cruelty to animals is now punishable in most of the States by fines, imprisonment, or both. In 1866 the first preventive society, the *New York Society for the Prevention of Cruelty to Animals*, was chartered by the State legislature at the suggestion of Henry Bergh, who was its first president for twenty-two years. The objects of the New York Society are to aid the police in the enforcement of existing laws relating to the protection of animals from wanton cruelty, and to carry on a propaganda for the enactment of further legislation with that end in view. Its agents have police power. The Pennsylvania Society for the Prevention of Cruelty to Animals, founded in 1867, is noted for its endeavors to prevent cruelty by moral suasion and practical advice. These two societies have been the model for the many affiliated societies that have since been formed in the United States and in other parts of America. Similar societies also exist in most of the countries of Europe, in South Africa, Australia, Mexico, Brazil, and the Argentine Republic.

Cruelty to Children. See **Children, Cruelty to.**

Cruikshank, Ernest Alexander (1854-1939), Canadian historian, was born in Welland County, Ontario. He had been in command of Military District No. 13, with headquarters at Calgary, Alta., since May 1, 1909. His published works include *Battle of Lundy's Lane* (1889); *Documentary History of the Campaigns on the Niagara Frontier, 1812-14*, (9 vols., 1896-1910).

Cruikshank, George (1792-1878), English caricaturist, was born in London, the son of Isaac Cruikshank, who, as well as his eldest son, Isaac Robert Cruikshank, was also a caricaturist. A publication, *The Scourge* (1811-16), afforded scope for the display of his satiric genius, and from that time forth he continued to pursue this vein with remarkable success. The exquisite series of colored etchings contributed to *The Humorist* (1819-21), and the etchings to the *Points of Humor* (1823-24), culminated in the etchings to *Peter Schlemihl* (1823), and to Grimm's *German Popular Stories* (1824-26). The little woodcuts contributed to the *Italian Tales* (1824), and the plates to Scott's *Demonology and Witchcraft* (1830), may be regarded as the last examples of his earlier and simpler

method as an etcher. His plates in *Bentley's Miscellany* mark a third period of his art and include the series for Dickens' *Oliver Twist*. Among the best productions of his later years are the elaborate etchings for Brough's *Life of Sir John Falstaff*, published in 1858. Consult *Lives* by Jerrold, Bates, Stephens, and Marchmont; Reid's *Catalogue* of his engraved works.

Cruiser, in modern naval parlance a vessel of war in which battery power and armor are sacrificed to secure speed and fuel capacity. It is a term of only comparatively recent use. In the early days of sailing navies, a small, fast class of vessels was used for scouting and carrying despatches. During the eighteenth century the importance of frigates as scouts for convoy and for operating against the enemy's commerce was fully understood. The fast sailing cruiser continued in use until after 1840. Toward the close of the Civil War several steam frigates of a very fast class were laid down. The most notable of these vessels was the *Wampanoag*. In the United States Navy, the first modern cruiser was the *Atlanta* (1884), of 16 knots. The *Columbia* (1892) and *Minneapolis* (1893) of 23 knots were the fastest cruisers then afloat. In the development of the man-of-war there have always been two opposing schools of design. One has advocated powerful ordnance, thick armor protection, and moderate speed; the other has stood for increased speed at the expense of armor, and even, to some extent, of ordnance. One of the early results of this divergence of thought was the evolution of the *armored cruiser*, a recent one is the *battle cruiser*. In the armored cruiser, size, armor, and the calibre of guns were all reduced, and speed was increased. Coincident with the development of the *armored cruiser*, the *protected cruiser* appeared. The protection consisted in a curved deck, nearly flat amidships, and descending near the sides at an angle of about 45 degrees to a point several feet below the water line.

Shortly before the Great War Admiral Fisher developed for the British Navy the *battle cruiser*, which marked a tremendous advance over the armored cruiser. In this type, armor protection is largely reduced, but the main battery guns are of the same calibre as those of contemporary battleships, and the number is nearly the same. The speed is very high, from 26 to 33 knots, and the radius of action is greater than that of battleships.

The development of the *battle cruiser* rendered the *armored cruiser* obsolete, and the *protected cruiser* never had amounted to any-

thing in any navy, although the protected deck principle persists in all capital ships and in some cruisers. So, along with the building of battle cruisers just before the Great War, both the British and the Germans built a new type of cruiser of small size, very light armor, high speed and light armament, which came to be called a 'light cruiser'. Both the Germans and the British found in the light cruiser a versatile ship, for offense or defense, and in the battle of Jutland there were 38 light cruisers engaged on one side and 37 on the other. The German light cruisers *Emden* and *Karlsruhe* made romantic records as commerce raiders in the Indian Ocean and in the Atlantic. In 1916 the United States Congress provided for the construction of ten light cruisers. The initial proposal for the limitation of armament made by the American delegation at the Washington Conference of 1921-1922, provided for the limitation of all classes of vessels in the ratio of 5 5:3: 1 75: 1.75. Great Britain and Japan heartily agreed to this in so far as it applied to battleships, in which the United States then had great superiority, and, in consequence the United States scrapped 13 capital ships which were nearing completion and which had been paid for, but, in regard to cruisers, in which Great Britain and Japan were superior to the United States these two nations declined to agree to any limitation. Thus the Washington Conference failed to place any limitation on the total tonnage or total numbers of light cruisers, but established two limitations on the size of individual light cruisers—they must not exceed 10,000 tons displacement or carry guns larger than eight inches.

The Conference had been ended only a few months when Great Britain and Japan began to build 10,000-ton light cruisers, and thereby increased their relative naval strength to such an extent that they precipitated a controversy concerning the shortsightedness of the American delegation at Washington, and the value of the assurances which other delegations had given when the United States was scrapping powerful new ships. Public sentiment in the United States demanded that action be taken and Congress in 1924 authorized the construction of eight new 10,000-ton cruisers. Before the initial funds for the last three ships of this programme had been voted, President Coolidge resorted to the expedient of issuing invitations to the naval powers for a conference 'to extend the principles of the Washington treaty to classes of vessels not limited by that conference.'

This led to the Geneva Conference of 1927 which accomplished virtually nothing. The London Conference of 1930 resulted in an agreement between Great Britain, Japan and the United States, allowing heavy cruisers of 10,000 tons. At the London Conference of 1935-36, a treaty was made between Great Britain, France and the United States specifying cruisers of 8,000 tons with 6 1/2 inch guns, but so conditioned as to be of doubtful effect. Then began the race of naval rearmament between the great powers. At the beginning of 1943, of cruisers carrying 8" guns 14 had been built and 8 were being built, and of cruisers carrying 6" guns 27 had been built and 32 were being built by the U. S. See NAVAL VESSELS.

Crumb-of-Bread Sponge (*Halichondria panicea*), a common British sponge, which covers much space on the shore rocks, where it forms a thick crust over stones, shells, weed, and even living crabs.

Crusades, or the Wars of the Cross (French *croisade*, Latin *crux*), religious wars carried on by the Christians of the West against the Mohammedans.

The first crusade was undertaken to assert and guarantee the right of Christian pilgrims to journey to Jerusalem, which had been denied by the Turkish conquerors. The Arabs, who wrested the Holy Land from the Eastern empire in the seventh century, had placed no obstacle in the way of pilgrims and native Syrian Christians, yet it was not till the Seljuk Turks overwhelmed the land in 1065 that Western Europe was deeply stirred. The Emperor of the East in 1073, Manuel VII., appealed to Pope Gregory VII.; and his successor, Urban II., moved by the appeals of Peter the Hermit, brought the agitation to a practical issue. At a council held at Clermont-Ferrand in France, in 1095, it was decided to wage a holy war against the infidel. *Deus vult*, by the injunction of Urban, was made the war cry of the expedition, and every one that embarked in it wore the sign of the cross, whence the name *crusade*.

Previous to the setting out of the great hosts of European chivalry, four disorderly armies, amounting in all to 275,000 persons, had departed for Palestine. The first consisted of 20,000 foot and was commanded by a Burgundian, Walter the Penniless. It marched through Hungary, but was cut to pieces by the natives of Bulgaria, only a few, among whom was Walter himself, escaping to Constantinople. The second, consisting of 40,000 men, women, and children, was led by Peter the

Hermit. It followed the same route as its predecessor, and reached Constantinople greatly reduced in numbers. Here the remnants united, crossed the Bosphorus, and were utterly defeated by the Turks at Nicæa, the capital of Bithynia. A third expedition of a similar kind composed of 15,000 Germans, led by a priest named Gottschalk, was massacred in Hungary; which also proved the grave of the fourth, a horde consisting of about 200,000 riffraff from France, England, Flanders, and Lorraine. After these first tempestuous hordes came the organized armies of the first crusade, which marched in five distinct bodies to their rendezvous at Constantinople—the first starting in 1096, and the last not reaching its destination till the summer of 1097. The leaders of these armies were Godfrey of Bouillon, duke of Lorraine; Raymond of Toulouse; Robert of Normandy, the son of William the Conqueror; Bohemond, son of Guiscard, with whom was the famous Tancred; and Hugh the Great, count of Vermandois, brother of the king of France. After some time the crusaders crossed into Asia Minor, accompanied by Peter the Hermit. Here their first step was the capture of Nicæa, the capital of Sultan Soliman (June 24, 1097). At length, on June 3, 1098, Antioch was taken, and the inhabitants were massacred by the infuriated crusaders, who were in their turn besieged by an army of 200,000 sent by the Persian sultan. Once more famine and pestilence did their deadly work. Multitudes also deserted, and escaping over the walls, carried the news of the sad condition of the Christians back to Europe. But again victory crowned their efforts; on June 28, 1098, the Mohammedans were utterly routed, and the way to Jerusalem was opened.

On a summer morning in 1099, 40,000 crusaders obtained their first glimpse of Jerusalem. On July 15, after a siege of rather more than five weeks, the city was delivered from the hands of the infidel. Eight days after the capture of the city, Godfrey of Bouillon was elected king of Jerusalem. His kingdom, at first comprising little more than the city of Jerusalem, was extended by conquest until it included the whole of Palestine. The best part of Asia Minor was restored to the Greek empire, while Bohemond became prince of Antioch. During nearly fifty years the three Latin kingdoms of the East—Edessa, Antioch, and Jerusalem—greatly increased in size, power and wealth.

In 1144 the principality of Edessa was conquered by the emir of Mosul, whose son, Nur-

ed-Din, advanced to destroy the Latin kingdom of Jerusalem. St. Bernard of Clairvaux preached the second crusade, and almost forced Louis VII. of France and Conrad III. of Germany to place themselves at its head (1147). An immense army crossed the Bosphorus; but the Byzantine emperor, Manuel Comnenus, was hostile and treacherous, and the crusaders met nothing but disaster, the forces led by Conrad being cut to pieces by the sultan of Iconium. Then, after attempting (1148) the siege of Damascus, the broken remnants returned to Europe. But the death blow of the Latin kingdoms came from Egypt, where the famous Salah ed-Din, or Saladin, had made himself sultan. He invaded Palestine, disastrously routed the Christians at Tiberias, and after a short siege captured Jerusalem itself in October, 1187.

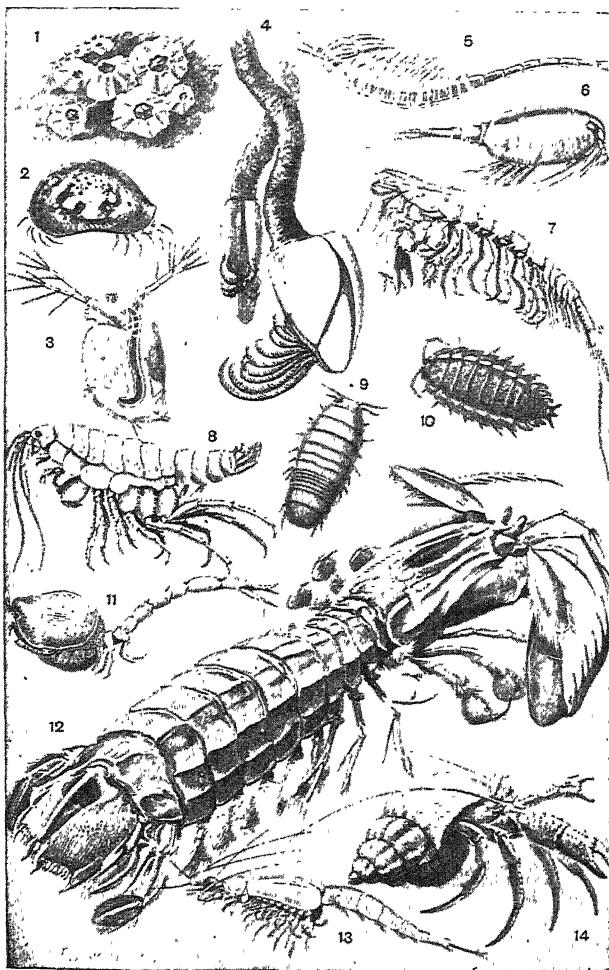
The above disaster spurred Europe to make another effort, and the third crusade is perhaps the most famous. Its leaders were Barbarossa, emperor of Germany, Philip of France, and Richard of England. Barbarossa was first in the field in 1189; but he was drowned in Pisidia (1190), and his forces were joined to the French and English armies in the siege of Acre, which, in spite of the efforts of Saladin, was reduced (July, 1191) after a siege of twenty-three months. The crusaders, however, were divided by mutual jealousies. Philip abandoned the cause, and Richard, after a series of romantic and valorous achievements, was content to make a truce (September, 1192) with Saladin on the basis of a right for pilgrims to visit Jerusalem without interference.

The Fourth Crusade is known as a pseudo-crusade, for the crusaders never reached the Holy Land at all, being diverted by the policy of Venice to attack the failing Byzantine empire, where they founded the Latin empire under Baldwin I. in 1204. The leader of the Fifth Crusade (1228-9), the Emperor Frederick II. recovered, by a truce with the sultan of Egypt, possession of Jerusalem, and indeed of a great part of the Holy Land. But Jerusalem having been again wrested (1244) from the Christians by the Kharezmians (people of Khiva), who were expelled from their country by the Mongols, the sixth crusade was undertaken (1248-54) by (St.) Louis IX. of France. But turning aside to lay siege to Damietta in Egypt, he was surrounded by Moslems, and, along with a large portion of his army, was taken prisoner. And though, after purchasing his freedom by a heavy ransom, he subsequently went on to Palestine, the expedition produced no

material results. Hence, in 1270, Louis organized the seventh crusade; but again he turned aside, this time to conquer Tunis for his ambitious brother, Charles of Anjou, and died of disease under its walls. This crusade,

for some time longer (till 1291) in possession of the Templars.

Amongst the most striking episodes of these great movements were what are known as the Children's Crusades. Of these there



Types of the Lower Crustacea.

1. Balanus. 2. *Cytherea lutea*. 3. *Dapania pulex*. 4. *Lepus anatifera*. 5. *Artemia salina*. 6. *Nebalia bipes*. 7. *Apocudes speciosus*. 8. *Orchestia Selkirki*. 9. Gribble. 10. Woodlouse. 11. *Cyclaspis pusilla*. 12. *Squilla nautis*. 13. *Mysis relicta*. 14. Hermit crab: 1, 4, 12, and 14 reduced about one-half; 2, 3, and 5 much magnified.

in which Edward of England, afterwards Edward I., took part, was the last effort, and the Holy Land was left in the hands of the infidel, although Acre, Antioch, and Tripoli remained

were two, both in 1212, the impelling idea in both cases being that children, who were innocent, would be able to accomplish what men who were sinful, were unable, or were

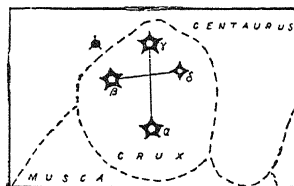
not permitted by God, to accomplish. In France a shepherd lad, Etienne or Stephen, a native of Cloyes, near Vendôme, announced that he was sent by God to crush the Saracens, God helping by working miracles; and so intense was the religious fervor and tension of the time that he was speedily joined by, it was estimated, 30,000 other children of both sexes. They embarked at Marseilles in seven vessels, of which two foundered off the coast of Sardinia, and the other five reached Alexandria, where, however, the children were seized and sold as slaves. At the same time as these events were happening a boy named Nicholas started a similar propaganda in Germany, and gathered together some 20,000 children, with whom he crossed the Alps, arriving at Genoa on Aug. 25, 1212. There the archbishop of the city persuaded them to return, when many of them perished on the way. The title of crusade was further applied to several other warlike undertakings of a semi-religious character. Apart from their own intrinsic importance, the crusades are historically interesting because of their effects upon the policy and progress of the West. In respect of the lasting and far-reaching consequences which they had for Europe, they may well be compared with the Reformation and the French Revolution. By attracting away many of the more lawless and adventurous nobles they contributed to the consolidation of modern European nations, and helped, through the common perils of the East, to create national sentiment. On the economic side of life their influence was enormous. The crusaders, and Europe through them, were familiarized with a higher standard of comfort and of luxury; and the necessity of providing transport and of keeping up supplies contributed to the rise of the commercial republics of Italy. Trade and industry both received a great stimulus, which was not exhausted when the discoveries of Vasco da Gama and Columbus gave a new direction to economic activity. See Gibbon's *Decline and Fall of the Roman Empire* (1776-88); H. H. Milman's *Latin Christianity* (1854-5); Hallam's *Hist. of the Middle Ages* (1871); T. A. Archer and C. L. Kingsford's *Crusades* (1894); Stanley Lane-Poole's *Saladin* (1900); Rev. G. Z. Gray's *The Children's Crusades* (1870); and, in addition, Sir Walter Scott's *Talisman* (1832) and *Count Robert of Paris* (1825).

Crusca, *Accademia della*, an academy founded at Florence in 1582 for the purpose of purifying and cultivating the Tuscan

language. It served as the model for the French Academy (see *ACADEMY*). The name of the Della Cruscan School is applied to a number of English residents in Florence who printed inferior sentimental poetry and prose in 1785. Among the Della Cruscans were Edward Topham, Mrs. Piozzi, and James Boswell.

Crusenstolpe, *Magnus Jakob* (1795-1865). He attacked the government in sharp, sarcastic articles and in 1838 he was condemned to three years' imprisonment for *lèse-majesté*—a sentence which led to bloody riots in Stockholm. In prison he began to write those curious books, half romance, half politico-historical memoir, with which his name is chiefly associated. See A. Ahnfelt's *M. J. C. Lefnadsteckning* (1880-1).

Crustacea, a class of arthropods, characterized by the fact that the head bears two pairs of antennæ or feelers, that the breathing organs are usually gills, and that the chit-



The Southern Cross.

inous coat is more or less impregnated with carbonate of lime. So diverse are the animals included in the class that these are practically the only characters widely distributed among its members, and even to these exceptions occur. Crustacea usually have an indirect life history, several larval stages often making their appearance before the adult form is reached.

Crustacea are divided into two main sets—the Entomostraca and the Malacostraca. The Entomostraca are small and simple, with a variable number of appendages, and no gastric mill.

The Malacostraca, or higher Crustacea, have typically nineteen segments and pairs of appendages, there is a gastric mill and the body may reach a considerable size. In the Entomostraca, as contrasted with the Malacostraca, the first larval form is a simple unsegmented creature with only three pairs of appendages, called the nauplius. This larva is rare among the Malacostraca, in which the first stage in development is usually a segmented animal. See *Standard Natural His-*

tory, vol. ii. (1885); A. S. Packard's *Zoology* (1897).

Crutched Friars, an order or friars which was instituted, or reformed by Gerrard at Bologna, and confirmed by Alexander III., 1169. They followed the Augustinian rule, and were known in England as 'the Cross-bearers' (crossed, crouched, or crutched), from the fact of their bearing a cross on the staves which they at first carried. At the Reformation had eleven houses in England, five in Scotland, and one in Ireland. They were suppressed in the United Kingdom in 1656. The site of their convent in London—between Jewry Street, Aldgate, and Mark Lane—is still known as Crutched Friars.

Cruz, the Southern Cross, a remarkable group of southern stars included by Ptolemy as part of the Centaur. Its principal stars may be identified with the 'quattro stelle' located by Dante near the south pole. They are arranged, not quite symmetrically, into a cross about 6° in length, the striking effect of which is enhanced by its erect position on the meridian. Being situated near the Antarctic circle it is never visible in northern latitudes.

Cruz, Juan de la (1542-91), whose family name was Yepes, Spanish poet, born at Ontiveros (Old Castle). At the age of twenty-one he became a Carmelite monk at Medina del Campo, and assisted Santa Theresa in her attempts to reform the Carmelite order. He was persecuted for these efforts, was condemned in 1591, and imprisoned in the monastery of Ubeda. He was canonized in 1726. Juan de la Cruz wrote much in both prose and verse—his works being of a mystical nature. His *Obras Espirituales* appeared at Seville in 1703 (12th ed.), and were reprinted in 1849, forming the twenty-seventh volume of the *Biblioteca de Autores Españoles*; they have often been translated into German, French, and English. See Rousset's *Les Mystiques Espagnoles* (1867); David Lewis's *Life of St. John of the Cross* (1897).

Cryolite, a pale gray or white mineral, sp. gr. 3. It has been found nowhere in the world but in Greenland, and has been used in the production of aluminum. In 1943 it was being manufactured synthetically in large quantities by the Aluminum Company of America.

Cryophorus, or 'frost carrier,' is an instrument, consisting of two bulbs connected by a tube, by which Wollaston demonstrated the loss of heat during evaporation.

Crypt, subterranean vaulted structure directly beneath the floor of the choir or east arm of the church, is appropriated to the bur-

ial of the dead. There are four apsidal crypts in England, of which Canterbury Cathedral (1096) is a good example. In the United States the crypt of the cathedral of St. John the Divine in New York was the first portion of the structure to be finished and was used for service.

Cryptogamia, the lowest of the two prime divisions of the kingdom of plants. The name was introduced by Linnæus in the *Systema Naturæ* (1740), to designate his twenty-fourth and last class of plants, containing the mosses, seaweeds, lichens, fungi, and ferns, in which the organs of sexual reproduction had not then been demonstrated. Endlicher ignored the cryptogams as a prime division, grouping the single-celled plants, algæ and fungi, as Thallophyta; and the mosses, in which the plant-body shows segmentation into stem and leaf, together with all more highly organized plants, as Cormophyta. The name Cryptogamia, however, is still used in the Linnæan sense, but with clearer definition and with three subdivisions—Thallophyta; Bryophyta and Pteridophyta. The reproductive bodies of all these plants are single-celled bodies called spores, separated from the parent plant and giving rise to an independent organism. Hence the term Sporophyta, or spore plants, is sometimes employed instead of the Linnæan name.

Cryptography is the art of writing in a secret manner, so that the meaning of what is written may be intelligible only to him who possesses the key to the cipher. Plutarch mentions a system used by the Greeks by means of the *scytala*, a small staff of wood, round which a long, narrow strip of parchment was wound, in spiral form, so that the edges of the parchment met, forming a continuous message, the Greek letters being cut in two. Ciphers were also extensively used among the Romans; Julius Cæsar used them occasionally. During the civil war in England many of the royalist papers were written in cipher, and some of them have only lately been read. At the present day ciphers are frequently to be found in the 'personal' columns of newspapers, when the message is not intended for the general public. Edgar Allan Poe, who was especially clever in unriddling cryptograms, declared that human ingenuity could not invent a cipher which human ingenuity could not solve.

Francis Bacon, who was a very zealous cryptographer, defines in *The Advancement of Learning* (1605) the requisites of a good cipher as being threefold: that it be easy to write and read: that it be difficult of detec-

tion; and that it be void of suspicion—which means that the message be written in such a manner as not to raise the suspicion of a stranger that it is a secret message. In his biliteral cipher, rendered famous by its resuscitation by Mrs. Gallup in her *Biliteral Cipher of Sir Francis Bacon*, 1899, Bacon showed how the letters *a* and *b* could be made to do duty for the whole alphabet, by various modes of combining them. Among the numerous methods of cryptography are: writing with invisible ink, which becomes visible under the action of heat; the use of superfluous words, where the correspondents agree that only some of the words, at equal intervals apart, are necessary to form the message; by misplaced words; by vertical and diagonal reading; by artificial word-grouping; by transposing the letters; by substitution of letters; by counterpart tabulations, with changes at every letter in the message according to a pre-arranged plan; and by a printed key and code-book, without a knowledge of which the message is undecipherable. The two best ciphers ever invented are Hogg's secret code, and Sir Charles Wheatstone's cipher, both of which, although complicated in system, are rendered easy to work by the adoption of ingenious mechanical arrangements which relieve the operator of all mental effort. See J. Falconer's *Cryptomengsis Patefacta* (1685), and Klüber's *Kryptographik* (1809), two works on cryptography which, though old, have never been excelled and Fleissner's *Handbuch der Kryptographie* (1881) for newer forms. Compare also TELEGRAPHY.

Cryptomeria (*C. japonica*), in botany, belongs to the Coniferæ. It is a large pyramidal, evergreen tree, with an upright, slender trunk, growing to a height of a hundred ft., and is a native of China and Japan. The variety most commonly cultivated is *C. elegans*. It is most interesting when young and is sometimes grown in pots.

Crystal Gazing. See **Dreaming**.

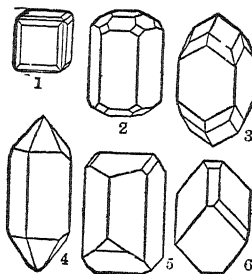
Crystalline Lens. See **Eye**.

Crystalline Rocks include all those whose component minerals are in more or less perfectly formed crystals, as distinct from the clastic, or fragmental rocks, the ingredients of which are in broken, rounded fragments, and organic rocks, which consist of the remains of animals or plants. The term, in fact, denotes rather the structure than the method of origin of its members, and embraces a large diversity of rock types.

Crystallites. In the case of many solutions, crystallization tends to be set up when

the solution cools and if the liquid is viscous, the formation of crystals goes on under great difficulties, and imperfect forms of crystallization result. These are called crystallites.

Crystallography. When a substance passes into the solid condition, either from the liquid or the gaseous state, or from solution in another medium, it may assume one of two forms: It may solidify as an amorphous mass or it may crystallize. The most perfect crystals are those which have been slowly formed. When crystallization goes on very rapidly,



Natural Crystals.

- 1, Fluorite; 2, beryl; 3, zircon;
4, topaz; 5, orthoclase; 6, axinite.

strange distorted crystals may form, and in other cases minute crystals are aggregated together to build up feathery growths or complex groupings like the frost flowers on a window pane. Crystallization is due to the tendency of the solid molecules, when free to arrange themselves in accordance with their mutual attractions, to take up a definite position relative to one another—that is to say, to adopt certain characteristic methods of 'packing.' Many rocks are crystalline, as, for example, granite and marble. Many metals, though apparently amorphous, consist really of very minute crystalline grains: this is the case with cast iron and zinc. The most perfect crystals are those of minerals, which have apparently been produced by the very slow evaporation or cooling of solutions in veins and cavities in the rocks, or by other very gradual and long-continued geological processes. Natural crystals are always imperfect, and their faces are often rough, irregular, or covered by impurities; but none the less, however irregular in their development, the faces always meet in certain constant angles, and these angles are often characteristic of the substance to which the crystal belongs. The faces of a crystal

may be divided into groups, each of which contains all those which obey a certain law, or have a certain definite relationship to one another. For the classification of the faces into similar groups or 'forms' it is usual to consider their relation to the crystalline axes. These axes are imaginary lines drawn through the centre of the crystal and they are always so placed that they are parallel to certain actual or possible crystalline edges. Crystals have been divided into six principal classes, according to the number and disposition of their axes. These classes are: Cubic, also known as isometric or regular; hexagonal; tetragonal; rhombic; monoclinic; triclinic. The faces of all known crystals can be classified and described by reference to these six systems of axes. A kind of notation used in the description of crystals is founded on this fact, that any face is defined by the relative distances from the centre at which it meets the axes. Miller's indices are now the favorite method of denoting crystalline faces and forms. It is found by experience that the indices of a crystal face are always simple rational numbers, such as $\frac{3}{2}$ or $\frac{1}{6}$ —never irrational fractions, and never very large. This is the second great fundamental law of crystallography, and is known as the principle of the rationality of the indices. As will be seen later, it is a direct consequence of the regular internal structure of crystalline bodies. Crystals may also be considered as solid bodies bounded by plane faces which show a definite symmetry in their disposition, and may be classified into groups according to their planes and axes of symmetry. The study of the symmetry of crystals has been remarkably developed, and has led to many important discoveries. The six systems already enumerated are now generally replaced by 32 classes based on the various kinds of symmetry which theory has shown may be exhibited by solid bodies; but all of these are not as yet known to occur in actual crystals. The internal molecular structure of crystalline bodies is not less important and significant than their external configuration, and is very closely related to it, being, in fact, its essential cause. The behavior of crystalline bodies when light is passed through them varies greatly, and depends on the direction in which the ray is transmitted, as well as on the nature of the crystal itself. All cubic crystals are isotropic; all others are doubly refracting, and a ray of light transmitted in most directions is broken up into two, each polarized and following different paths. This

is well known in the case of Iceland spar, which possesses this property in a remarkable degree (See PETROLOGY).

One of the most interesting branches of crystallography is the study of the behavior of different classes of crystals when attacked by a solvent. The computation of crystallographic constants based upon measurements of interfacial angles constitutes the field of Mathematical Crystallography. The precise form assumed by a substance crystallizing in any other than the regular system is an accurate indicator of its composition and identity. This is made much use of in mineral identification.

See MINERALOGY. Consult Maskelyne's *Morphology of Crystals*; Lewis' *Crystallography*; Tutton's *Crystallography* (1922); *idem*, *Natural History of Crystals* (1924); Winchell's *Elements of Optical Mineralogy* (1928); P. Groth, *Introduction to Chemical Crystallography* (1906).

Crystalloid, in botany, minute portions of the protoplasmic substance of cells which assume the form of crystals. They are usually colorless but sometimes act as vehicles of coloring matter, other than green, which can be removed from them. They are oftenest found in oily seeds.

Crystalloid, the name given to those substances which when in solution will pass through vegetable parchment or animal membrane in dialysis, in distinction from colloids, which will not do so. They include metallic salts, sugar, and oxalic acid. See DIALYSIS.

Crystallomancy. See DIVINATION.

Crystal Palace, a vast structure of glass and iron, designed by Sir Joseph Paxton, and erected in Hyde Park, London, for the Great Exhibition of 1851. It was removed to Sydenham in 1854, and became a place of popular entertainment. In 1911 it was purchased by the first Earl of Plymouth to be held in trust for the British nation. It was destroyed by fire on November 30, 1936. See EXHIBITIONS.

Csardas, (Hung. *Csárda*, a wayside inn), a Hungarian national dance in two movements—an *andante* and an *allegro*—both in the same key, and always in $\frac{4}{4}$ or $\frac{2}{4}$ time.

Csengery, Anton (1822-80), Hungarian author and statesman. He did much for the economic development of Hungary, and was a founder and director of the national land credit institute. From his pen came some well-written historical studies. His complete *Works*, including a translation of Macaulay's *History of England*, appeared 1884 in 5 vols.

Csepel, island of Hungary, between two arms of the Danube, stretches 27 m. south of Budapest. It produces fruit and wine; formerly a favorite royal summer residence

Csiky, Gregor, or **Gergely** (1842-91), Hungarian dramatist, distinguished for his lifelike portrayal of the simple incidents of modern life. His novels were eclipsed by his plays, *Az Ellen állhatatlan* ('The Irresistible'), which gained the Hungarian Academy's prize, *A Proletárok* ('Proletariat'), etc.

Csokonay, Vitéz Mihály (1773-1805), Hungarian poet. He derived his inspiration from the folk-songs of Hungary and made a valuable contribution to the development of national Hungarian poetry. His complete works appeared in 1831 (4 vols.) and in 1924 (3 vols.). Consult Schwicker's *Geschichte der ungarischen Literatur*.

Csóma de Korös, Sándor (c. 1790-1842), Hungarian scholar and traveller. In 1820 he started in Eastern attire for Central Asia, in quest of the original home of his countrymen, the Magyars, and travelled through Persia and Afghanistan to Tibet. After years of privation and patient labor, he succeeded in compiling a grammar and dictionary of the Tibetan language. Returning to Calcutta, he saw his books through the press, and was appointed secretary of the Asiatic Society. He had scarcely started on a third journey to Tibet when he died of fever at Darjiling. Consult *Life* by Duka.

Ctenophora, or **comb bearers**, a class of the Cœlenterata, comprising beautiful free-swimming marine animals, generally though not always ellipsoidal in form, and moving by the aid of eight 'combs' or rows of ciliated plates. Ctenophora are hermaphrodite, carnivorous in diet, extremely active in habit, and often phosphorescent. They are found at the surface of nearly all seas but are especially common in warmer regions.

Ctesias, of Cnidus in Caria (fl. 400 B.C.), a Greek historian, who wrote a history of the Persian nation which professed to correct the account of Herodotus, but only fragments and an abridgement in Photius remain. He also wrote a treatise on India. His fragments have been edited by Bähr (1824) and Gilmore (1888). Consult J. P. Mahaffy's *History of Greek Literature*.

Ctesibius, (c. 250 B.C.), a Greek to whom the invention of the clepsydra, or water-clock, and of a hydraulic organ is attributed. He also discovered the elasticity of the air, and used air in the transmission of power.

Ctesiphon, now called **Modain**, ancient

city of Assyria, on the east bank of the Tigris, about 25 m. southeast of Bagdad. Between 37 and 32 B.C. it was the capital of the empire of the Parthian king Phrattes IV. In 116 A.D. it was captured by the Roman emperor Trajan and in 199 by the Emperor Septimius Severus, who carried away 100,000 prisoners. It was besieged by Odenathus, husband of Zenoba, queen of Palmyra in 263, and was the scene of the defeat of the Persians by the Emperor Julian in 362. It was abandoned to the victorious Arabs by the last of this dynasty, Yazdigerd, in 637, and thereafter fell into decay. During the World War Ctesiphon marked the limit of British advance in the ill-starred attempt of General Townshend to reach Bagdad, Nov. 21, 1915. See EUROPE, GREAT WAR OF.

Cuanza, the largest river in Angola, Portuguese West Africa, with a total course of 500 m. marked by frequent rapids during its descent from the Tala Mugongo plateau.

Cuba, the largest and most westerly island of the West Indies, constituting the republic of Cuba, occupies an advantageous position at the entrance to the Gulf of Mexico, 130 m. south of Florida, from which it is separated by Florida Straits. Its northern and western shores are washed by the Gulf of Mexico and the Atlantic Ocean, and its southern and eastern coasts by the Caribbean Sea. It is long and narrow in shape, curving upward to the north near the western end. From Cape Maysi, the most easterly point, to Cape San Antonio, the most westerly, the island measures nearly 800 m.; the width varies from 20 m. in the neighborhood of Havana to 90 m. in the eastern part. The area is 41,634 sq. m., with adjacent islands, 44,164 sq. m. The coast line, some 2,500 m., is broken and irregular, with numerous bays, lagoons, coves and islets. There are many excellent harbors, more than 50 being ports of entry. The largest of the adjacent islands is the Isle of Pines, 1,180 sq. m., 35 m. to the south.

The eastern portion of the island of Cuba is mountainous; the central part consists of gently sloping plains, well-drained and densely cultivated with sugar-cane; the western end is hilly, with fertile slopes and valleys devoted to the cultivation of tobacco, for which the island is famous. The highest point on the island is the Monte Turquino (8,320 ft.). Rivers are numerous, many of them broad and beautiful, but only one, the Cauto, in the province of Oriente, is of commercial importance. Though it lies wholly within the tropics, Cuba is cooler than the other West

Indian islands. The island is sometimes visited by hurricanes of great violence, and earthquakes occur in the eastern districts. Since the introduction of sanitary measures following the occupation by the United States (see *History*), yellow fever, long a deadly scourge, has disappeared and Cuba has become one of the most healthful countries of the world. The Cuban flora comprises over 5,000 species, including valuable forest woods, such as mahogany, cedar, *lignum-vitæ*, sandalwood, ebony, and logwood, and a great variety of tropical fruits, flowers, and plants, which thrive luxuriantly in the rich soil. Animals are few, but birds are numerous, including many songsters and some true game birds. The rivers, bays and seas abound in fish, crabs, shrimps, and lobsters. Insects are abundant and troublesome. Mineral resources include iron, asphalt, manganese, coal and copper, but agriculture is the main industry. As the world's largest sugar producer, Cuba's prosperity since the 18th century has depended upon this crop, of which most went to the United States. In 1924 the sugar market was over-supplied, and Cuban producers suffered severely. The government endeavored to promote diversification of agriculture and industry, but with small success. The Smoot-Hawley Tariff of 1930 further crippled the sugar trade; prices fell to less than half—the lowest in history, to 15 per cent. less than cost. Cuba accepted the Chadbourne plan for sugar restriction in 1931, sacrificing more than any other sugar-producing country. During prosperous years the people developed a high standard of living, and Cuba was the fourth best customer of the United States.

Tobacco and its manufactures stand second to sugar. Coffee growing has been an important industry for more than a century, and government has urged increased production. Diversified farming, to offset the sugar and tobacco decline, has increased fruit and vegetable produce, notably pineapples, bananas, citrus, cocoanuts and potatoes. The population of the island is 4,228,000. The principal cities are Havana, the capital, 569,000; Santiago, 143,446; Camagüey, 135,352; Cienfuegos, 87,669; Matanzas, 68,772.

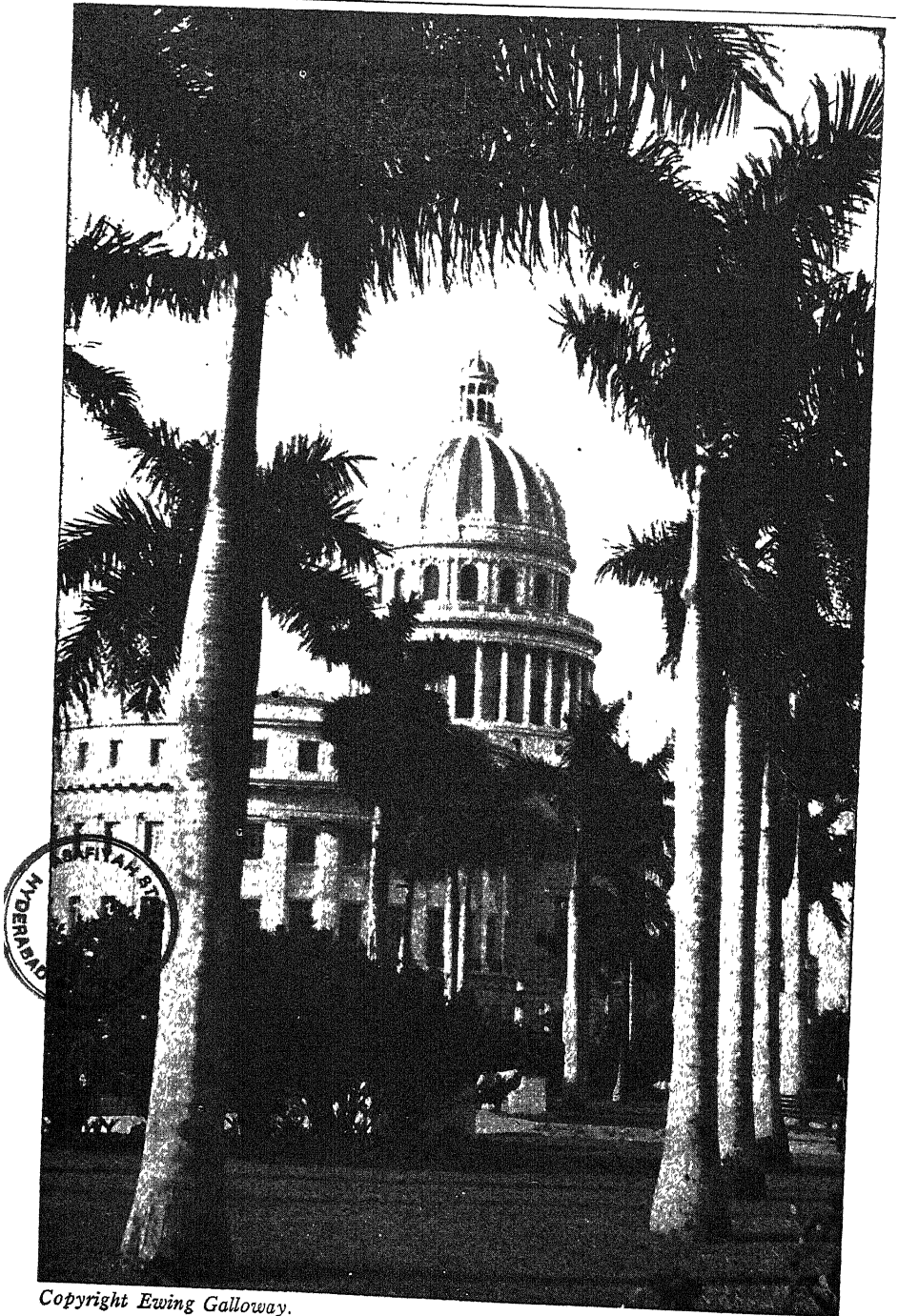
Since 1901 Cuba has been an independent republic with a President, Senate, and House of Representatives. The president is elected by indirect vote for six years and may serve only one term. He is assisted by an appointive cabinet. The Senate consists of 37 members, and the House of Representatives of 128 members, elected by male and female suffrage.

The republic is divided into six provinces and 119 municipalities. Each province has a governor elected indirectly by the people, and a council. The municipalities are administered by mayors and elected councils. The gold peso, equivalent to the American gold dollar, is the unit of value. In April, 1931, the Cuban government engaged Prof. Edwin R. A. Seligman of Columbia University as economic adviser to reform the tax system. His recommendations were in general neglected. Cuba was discovered by Columbus on Oct. 28, 1492, and was at first believed by him to be part of the continental mainland.

In 1512 an expedition of 300 Spaniards commanded by Diego Velasquez made a settlement at what is now the town of Baracoa on the n.e. coast; in 1514 Santiago and Trinidad were founded, and a settlement was made on the southern coast known as San Cristóbal de la Habana, whose inhabitants five years later removed to the site of the present capital on the northern coast. Their ability to exact labor from the Indians in cultivating the land tempted the colonists to establish slavery; after the natives had been almost exterminated, Negroes were brought to fill their places, and thus a traffic was begun which was not suppressed until 1845. The early History of Cuban settlements was marked by many dangers.

Spain from the first treated the island as a possession to be exploited for precious metals; and when these were not found, the same policy was followed in regard to the sugarcane, tobacco and other industries. Las Casas, who was made captain-general in 1790, was an illustrious exception, and successfully labored to promote good feeling towards the mother country. In 1868 a rebellion against Spanish injustice and oppression broke out which ravaged the island for ten years. This was terminated by the Treaty of Zanjón. In 1895 revolt again flamed up and became so formidable that General Campos was sent from Spain to subdue it. He failed and was succeeded first by Weyler, and later by General Blanco. For the protection of American interests the battleship *Maine* was sent in January, 1898, to Havana harbor and on February 15 it was blown to pieces.

United States interest in Cuba's fate had begun to be aroused as early as 1823 under President Monroe, and in 1848 had been directed toward a project of purchase and annexation, which, however, was declined by Spain. By the destruction of the *Maine* public opinion in the United States was strongly



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New Capitol of Cuba, at Havana.

aroused, and on April 19 Congress passed a resolution which declared for the independence of the Cuban people. War with Spain followed (see SPANISH-AMERICAN WAR); the island was taken under American protection on Jan. 1, 1899, and placed under military control until May 20, 1902, when independent government was formally installed. On Feb. 21, 1901, a constitution was adopted modelled upon that of the United States, and the following December the first president of the republic, Estrada Palma, was elected. By accepting the Platt Amendment (June 12, 1901), Cuba remained under American suzerainty, not being permitted to make any foreign alliances without American consent, nor to negotiate loans for which it would be unable to pay. The harbor of Guantanamo was to be held by United States as a naval base. Revolutions were not permitted, and the United States reserved the right to intervene for the maintenance of adequate government and the protection of life and property.

In 1903 a reciprocal commercial convention was concluded between United States and Cuba. General José M. Gomez (1909-13) and General M. Menocal (1913-21) were constructive presidents. In February, 1917, a revolt headed by Gomez failed after drastic measures and warnings from Washington. Cuba was the first among the Latin-American nations to declare war on Germany, April 7, 1917. In 1924 General Gerardo Machado was elected president and attempted to improve the economic conditions by restricting sugar production, by a protective tariff to increase agricultural production in Cuba, and by public works, to reduce unemployment. In accordance with his policy not to borrow foreign money, he imposed certain new taxes to finance his program. In 1927 Machado abandoned his opposition to foreign loans. Cuba's borrowings in the United States increased to \$213,000,000 as compared with less than \$100,000,000 in 1924. The population was reduced to starvation and vainly clamored for a debt moratorium and relief from distress. A revolt in August, 1931, was soon crushed, but terrorism continued despite martial law.

The struggle raged chiefly between the 'ABC'—an underground organization of 5,000 to 10,000 students of the University—and others, and a body of government storm troops, the 'Porra' (club, bludgeon), recruited largely from criminal elements. Students were ever a political force in Cuba. They opposed Machado's rule and the closing of their University; later they refused to return to

school so long as Machado remained. The ABC was blamed for the assassination of the secret police head, the president of the Senate, the head of the Porra, and many others. To the Porra were attributed torturings and killings of students and others under the *ley de fuga* (law of flight), which permitted the killing of prisoners attempting escape.

On Aug. 11, 1933, the Cuban army demanded Machado's resignation. United States influence operated against his despotic regime, and on the 13th Machado fled from Cuba and after living several months in Canada has now established his home in Italy. Next day Dr. Carlos Manuel de Cespedes became provisional president. On September 1 a terrific hurricane devastated parts of north Cuba. While the President was away from the capital inspecting the havoc left by the storm, another military revolt broke out (Sept. 8) and de Cespedes was forced to resign. American interests were capably represented by Ambassador Sumner Welles, and the United States Government promptly despatched warships to Cuban waters.

Dr. Ramon Grau San Martin next occupied the president's chair from September 10, 1933, to January 15, 1934, after which Carlos Hevia was inducted for two days. Carlos Mendieta was made provisional president on January 18 following, but resigned on December 12, 1935, to be succeeded by Dr. Jose A. Barnet (Secretary of State). An election took place on January 11, 1936, and Dr. Miguel Mariano Gomez, former mayor of Havana, was elected president. He was impeached by the House of Representatives on December 22, 1936, for vetoing a sugar tax bill to provide schools under army control, and two days later he was removed from office. He was succeeded by Vice-President Federico Laredo Bru.

Fulgencio Batista, former Chief of Staff of the Cuban Army, efficiently organized all police and military forces. In 1934, Cuba and the United States signed a treaty abrogating the Platt amendment under which the United States in 1903 retained the right to intervene in Cuba's foreign and financial affairs. In 1936 Cuba adopted a new Constitution, establishing a semi-parliamentary government, with a premier appointed by the President. Cuba declared war on Ger., It., and Jap., 1941.

Consult C. Beals, *Crime of Cuba* (1933); H. S. Ruben, *Liberty* (1932); T. P. Terry, *Guide to Cuba* (1929); *Cuba Past and Present* (1920); *Cuba of Today* (1931); R. R. de Yrizar and A. Tremols, *All the Facts You*

Want to Know about Cuba (1928); H. Strode, *The Pageant of Cuba* (1934).

Cubature, the process of determining the volume of a solid. When not a simple matter of mensuration, this requires the methods of the differential and integral calculus.

Cube, a regular solid bounded by six equal square plane faces, the opposite sides being parallel to each other.

Cubebs, or **Cubeb Pepper**, the dried, unripe fruit of a climbing plant, *Piper cubeba*, a native of the Asiatic and Pacific islands.

Cubism. See **Post Impressionism**.

Cubit, an ancient measure of length, determined by the distance between the elbow and the tip of the middle finger (*cf.* Span, Palm, Foot). Most approximations make it lie between seventeen and eighteen inches.

Cubitt, **Sir William** (1785-1861), English civil engineer, constructor of canals, docks, and railways. He invented the treadmill, for the purpose of utilizing the labor of convicts.

Cuchullin, the chief heroic figure in the legendary history of Ireland, whose exploits are comparable to those of Hercules and the heroes of Greek mythology.

Cucking-stool. See **Ducking-stool**.

Cuckoo, (*Cuculus*), a well-known genus of birds in the order Coccothymophæ, and type of a large family, Cuculidæ. The common cuckoo (*Cuculus canorus*) is a widely distributed bird, breeding in summer in the northern parts of Europe and Asia, and migrating in winter to Africa, as far as the Cape, or to India. The female does not construct a nest, but lays her eggs singly on the ground, and conveys them in her bill to the nest of some other small bird, whose eggs resemble her own. The young cuckoo ejects the rightful nestlings, and so appropriates the whole care and attention of the foster-parents, who do not seem aware of the imposition. The young cuckoos may stay until October, and then follow the parents southward. The American cuckoos, of which there are a dozen or more species, resemble their European prototypes except that they are not, as a rule, parasitic. The most common species are the Yellow-billed Cuckoo (*Coccyzus Americanus*), and the Black-billed Cuckoo (*C. erythrophthalmus*).

Cuckoo Bee, a name applied to the bees of the family Nomadidæ, which are parasitic in character.

Cuckoo Fly, a metallic green insect belonging to the family Chrysididæ. These insects deposit their eggs in the nests of solitary bees or wasps. The newly-hatched lar-

væ either destroy the rightful owners or starve them out.

Cucumber. The common garden cucumber (*Cucumis sativus*), native to Southern Asia, has been in cultivation since the earliest times for its green cylindrical fruit, which is used for salads and pickles. The Gherkin from the West Indies is a small spiny pickling cucumber (*C. anguria*). The striped and the spotted cucumber beetles are the most serious insect pests.

Cucumis, a genus of half-hardy trailing herbs belonging to the order Cucurbitaceæ.

Cucurbitaceæ, a natural order of climbing plants with solitary lateral tendrils. The bryony, cucumber, melon, squash, pumpkin and vegetable marrow are among the more important representatives.

Cudahy, Milwaukee co., Wisconsin; on Lake Michigan. Industrial establishments include foundries, a meat-packing plant, rubber manufacturing, machinery, automobile parts; p. 10,561.

Cudbear (*Lecanora tartarea*), a lichen formerly celebrated for the purple dye which it yielded on treatment with ammonia.

Cuddalore, **Kudalur**, or **Gudulur**, chief town, South Arcot district, Madras, India. It exports grain and manufactures oil, indigo, and sugar. Two indecisive naval battles between English and French between 1758-1795 occurred near here; p. 56,575.

Cuddapah, district and town, Madras, India. Exports of cotton and indigo; p. district about 1,300,000; town, 16,000.

Cudweed, a name given to various members of the genus Gnaphalium.

Cudworth, **Ralph** (1617-88), one of the most prominent writers of the English philosophical school known as the Cambridge Platonists, in 1654 became master of Christ's College. See *Cudworth's Life* by Birch (1837-8); an abridgment of the *Intellectual System* by Wise (1706); Dr. Martineau's *Types of Ethical Theory* (1885).

Cuenca. 1. Province, Spain, mainly mountains and valleys, covered to a great extent with forests. 2. City, cap. of above prov. A quaint, ancient city with a fine Gothic cathedral and a notable bridge over the Jucar; p. 13,727. 3. Capital of dep. Azuay, Ecuador. It has a cathedral, several convent chapels, a university; p. about 25,000.

Cuernavaca, tn., cap. of Morelos, Mexico, on a mountain spur in a beautiful valley; near by are Aztec temple ruins. Cortés resided in it, as also did the Emperor Maximilian; p. 13,000.

Cuero, tn., Tex., co seat of Dewitt co. Its manufactures include cotton, cottonseed oil, leather, machinery; p. 5474.

Cuesta, a term originating among American physiographers for a land form whose sides slope in opposite directions from a crest of relatively uniform level, one slope being much steeper than the other. Upper Niagara river flows in such a cuesta representing an ancient coastal plain.

Cueva, **Juan de la** (1550-1607), Spanish poet, must be considered as one of the founders of the Spanish national drama. He also wrote *El Exemplar Poetico*, a sort of *Ars Poetica*, the first of its kind in Spanish literature.

Cui, **Cæsar** (1835-1918), Russian soldier and composer, born at Vilna. He composed operas and compositions of the new Russian musical school.

Cuirassier, a horse-soldier wearing a cuirass—a piece of armor consisting of a breast-plate and a back-plate, buckled or otherwise fastened together.

Cujas, **Jacques** (1522-99), whose name was Latinized as Cujacrus, French juriconsult, and founder of the historic school of law. See Berriat St. Prix's *Histoire du Droit Romain, suivie de l'Histoire de Cujas* (1821).

Culberson, **Charles A.** (1855-1925). Am. legislator; U. S. Senator, 1899-1905.

Culbertson, **Ely**, (1891-), contract bridge authority; born Roumania, son of Almon Elias (American) and Xenia Rogoznaia Culbertson; wrote *The Blue Book of Contract Bridge*; *Culbertson's Summary*; *Summary of the World Federation Plan* (1943); *Total Peace* (1943).

Culdees, religious communities which spread over Ireland and Scotland from the 9th to the 12th century, included all the anchorites and priests not members of a monastery. In Ireland the Culdees never attained importance. Under the reorganization of the Scottish Church, begun by St. Margaret, the Culdees became regular canons, or were absorbed into the religious orders. Many of the clergy had wives. For further information, see Reeves's *The Culdees of the British Islands* (1864); and H. Zimmer's *The Celtic Church in Britain and Ireland*, trans. by A. Meyer (1902).

Culiacan, tn. and episc. see, cap. of state of Sinaloa, Mexico. It is one of the oldest settlements in the New World, dating from 1531; gold and silver ores of the Sinaloan mines are exported; p. 13,578.

Culin, **Stewart** (1858-1929), American

anthropologist. He was appointed a curator of the Museum of Archaeology at the University of Pennsylvania in 1899, and its director in 1892. He published his investigations as to Chinese games and other subjects.

Cullen, **Paul** (1803-78), Irish cardinal and archbishop, born in Co. Kildare. Appointed rector of the Irish College in Rome, and rector of the Propaganda College, he averted confiscation of the property of the latter college during the revolution of 1848. Appointed Archbishop of Dublin (1852), and created a cardinal (1866), he was the first Irishman to reach that dignity since the Reformation. Cardinal Cullen incurred personal odium by aiding the British government in the suppression of Fenianism.

Cullinan Diamond, largest known diamond, named after the chairman of the Premier (Transvaal) Diamond Mine Company, in whose mines it was discovered in January, 1905. The total weight uncut was 3,255 $\frac{3}{4}$ carats. It was cut (1908) into nine principal parts besides a quantity of 'ends,' the first and second being the largest cut diamonds in existence.

Culloden, or **Drumossie Muir**, battlefield, Scotland. Prince Charles Edward was defeated by the Duke of Cumberland in 1746. The battle is commemorated by a cairn 20 ft. high, erected in 1881.

Cullom, **Shelby Moore** (1829-1914), American political leader, governor of Ill. (1877-83). In 1908 he was one of the commissioners appointed to draw up a system of laws for the Hawaiian Islands.

Cullum, **George Washington** (1809-92), American soldier, and military engineer, at the outbreak of the Civil War was an aide-de-camp to Gen. Winfield Scott. He was Gen. Halleck's chief-of-staff, and in 1865 was brevetted major-general for his services. From 1864 to 1866 he was superintendent of West Point. He gave \$250,000 to West Point for the erection of a memorial hall. He edited a valuable *Biographical Register of the Officers and Graduates of the United States Military Academy at West Point* and other works.

Culmination, the position of a heavenly body when it crosses the meridian.

Culp, **Julia** (1881-), Dutch contralto singer. In 1913 she made her first appearance in the United States. She is an enthusiastic interpreter of the works of Hugo Wolf.

Culpa, Roman law term for such fault or carelessness as infers legal liability.

Culpeper, **John**, one of the Carolina settlers, was born in England and became sur-

voyer-general of the Carolinas, where in 1678 he organized an insurrection in the Albemarle colony.

Culpeper, Thomas (?-1719), Colonial governor of Virginia, was born in England, and received (1673) from King Charles II., with other grantees, the entire colony of Virginia for a period of thirty-one years. Returning to England in 1683 without permission, he was arrested, and for sundry reasons his commission was declared forfeited.

Cultivated Plants. Fully five thousand years ago, millet, rice, sweet potatoes, and wheat were cultivated by the Chinese. It is sometimes a difficult question to determine whether a plant is really a native or has been first introduced into cultivation and then become naturalized. Some plants are cultivated for their underground parts, as the potato; many for their fruits, as the orange; some, for their leaves, as tea; a few for their edible flowers, as the clove; others for their seeds, as the oat; still others for their beauty and decorative value.

Cultivation. See **Tillage**.

Cultivator, called also a grubber or scarifier, an agricultural implement used chiefly in the United States, to prepare soil for planting or to loosen it between rows of plants.

Culvert, an arched, walled underground watercourse, usually of masonry or brickwork.

Cumacea. See **Crustacea**.

Cumæ, ancient city of Italy, near the coast, w. of Naples, was founded about 1050 B.C. It was one of the principal centers from which Greek civilization was disseminated through Southern Italy. It fell into decay under the Roman emperors, though chosen as a place of residence by Cicero and other distinguished men. Near it are several caves, one of them the dwelling-place of the Cumæan sibyl, who gave the fateful Sibylline Books to Rome.

Cumberland, a sloop of the United States navy, sunk in battle with the *Merrimac*. See **MONITOR**; **HAMPTON ROADS**.

Cumberland, maritime county in the northwestern part of England, bordering on Solway Firth and the Irish Sea. There are many picturesque lakes. Carlisle is the capital; other towns of importance at Whitehaven, Workington, Brampton, and Maryport; p. 273,937. It is rich in mineral and agricultural wealth.

Cumberland, city, Maryland, second city of the State, county seat of Allegany co. Its

prosperity and rapid growth are due mainly to the traffic in coal from the tributary Cumberland region. This was the starting point of the Great National Road, often called the Cumberland Road, which was an important highway in opening up the West; p. 39,483.

Cumberland, town, Rhode Island, Providence co. A monument marks here the grave of William Blackstone, founder of the town of Boston, and the first white settler in Rhode Island. After his differences with the Puritans in Boston he left that colony in 1635; p. 10,-625.

Cumberland, Richard (1732-1811), English dramatist, poet, and essayist. Goldsmith overrated him by describing him as 'the Terence of England,' but Sheridan underrated him by satirizing him as Sir Fretful Plagiary in the *Critic*. The *Memoirs of Richard Cumberland*, written by Himself, appeared in 1806, and his posthumous dramatic *Works* were edited by Jansen in 1813.

Cumberland, Richard (1631-1718), English moral philosopher, a college friend of Pepys. As an author, Cumberland's fame rests especially on his *De Legibus Naturæ Disquisitio Philosophica* in which he opposed the doctrine of Hobbes. Consult Albee's *History of English Utilitarianism*.

Cumberland, William Augustus, Duke of (1721-65), third son of George II., was dispatched against Prince Charles Edward Stuart in Scotland, won a signal victory at Culloden, and by his needless severities against the Highlanders earned for himself the title of 'the Butcher.' Defeated at Hastenbeck by D'Estrées, he surrendered with all his army at Kloster-Zeven.

Cumberland Gap, a pass in the Cumberland Mountains. In April 1865 nearly 1,000 Confederate soldiers surrendered and were paroled here.

Cumberland Island, really a peninsula in the e. of Baffin Land, Canada.

Cumberland Mountains, a range of the Appalachian system in the Southern States. It extends s.w. from West Virginia, forming the boundary between Kentucky and Virginia, crosses the eastern part of Tennessee, as a broad plateau, and enters the n.e. corner of Alabama.

Cumberland River, a left bank tributary of the Ohio River, which it joins at Smithland, Ky. It rises in the Cumberland Mountains in Kentucky and is nearly 700 miles in length.

Cumberland Road. See **National Road**.

Cumberland University, an institution of learning for both sexes at Lebanon, Tennessee, chartered in 1843.

Cumberland Valley, part of the Great Appalachian Valley, a continuation of the Shenandoah Valley of Virginia, extending across Maryland and into Pennsylvania to the Susquehanna R. It is famed for its fertility.

Cumbraes, Great and Little, two islands in Firth of Clyde, Scotland.

Cumbrian Mountains, a group of mountains in Cumberland, England. They are the mountains of the Lake District.

Cumin, or **Cummin**, is the Caraway-like fruit of an annual umbelliferous plant, *Cuminum cyminum*, which grows wild in the neighborhood of the Nile, along the Mediterranean coast, and in Arabia and India.

Cumming, Hugh S. (1869-), surgeon general, was born in Virginia, and obtained his degree of M.D. at U. of Va. During the World War he was Public Health Service Expert on duty with the Navy. Has been surgeon general of the U. S. Public Health Service since 1920. He is the author of works on public health.

Cumming, John (1807-81), Scottish writer on prophecy. See George Eliot's essay on him, *Evangelical Teaching: Dr. Cumming*.

Cummings, Amos Jay (1841-1902), American journalist, was born at Conkling, N. Y., and worked as a compositor in the office of the N. Y. *Tribune*, becoming in succession night editor, city editor, and political editor of that paper. Subsequently he became a member of the editorial staff of the N. Y. *Sun*. He was elected to Congress from New York in 1886, and was reelected until his death.

Cummings, Homer Stillé (1870-), Attorney General of the U. S., was born at Chicago, Ill. He was educated at Yale, was admitted to the bar in 1893, was in law practice at Stamford, Conn., until 1933. After 1900 he was a prominent member of the Democratic party. From 1914-24, when he resigned, he was State's Attorney for Fairfield Co., Conn. On March 4, 1933, he became Attorney General in President Roosevelt's Cabinet. Resigned 1938.

Cummings, Joseph (1817-90), American educator, became president of Wesleyan, retiring in 1875 as professor of mental philosophy and political economy. In 1881 he was elected president of Northwestern University, Ill.

Cummings, Thomas Seir (1804-94), American artist, was born in England and was brought to New York as a child. He became

one of the most expert miniature painters of his time.

Cummins, Albert Baird (1850-1926), American legislator. He was governor of Iowa in 1902-08, elected U. S. Senator in 1908 and 1909.

Cummins, Maria Susanna (1827-66), American novelist. Her novel, *The Lamp-lighter*, 1854, had great success.

Cumnor, vil. and par. in Berkshire, England. Cumnor Hall, now destroyed, was famous as the place where Amy Robsart, wife of Robert Dudley, afterwards Earl of Leicester, met her untimely death. It is the Cumnor Place of Scott's *Kenilworth*.

Cunard, Sir Samuel (1787-1865), Anglo-Canadian shipowner, born at Halifax, Nova Scotia. See CUNARD STEAMSHIP LINE.

Cunard Steamship Line. The Cunard Steamship Company, established in 1878, to take over the business of the British and North American Royal Mail Packet Company and the British and Foreign Steam Navigation Company, actually dates from 1839, being the oldest passenger line between the U. S. and Great Britain. Having the government mail contract in 1840 Sir Samuel Cunard first established steamship postal communication between England and America. During the Crimean War, 14 Cunard ships were put at the disposal of the British government. During the World War 22 steamers, among them the *Lusitania*, were lost. The company purchased many other lines or an interest in them, now owning ships to Canada, Australia, etc. In 1912 it acquired the Anchor Line; lately it has combined with the White Star. Its largest ship in present operation, the *Queen Mary*, 81,235 tons, holds the record of crossing the Atlantic in 3 days 20 hours and 42 minutes, established 1938. The line, now known as the Cunard-White Star Line, launched a larger ship, 1938, the *Queen Elizabeth*, 85,000 tons, for service in 1940.

Cunas (*Tulé*), a Central American people, formerly dominant in the Darien peninsula and the Lower Atrato valley. See Brinton, *The American Race* (1901).

Cunaxa, tn., Babylonia, on the l. bk. of the Euphrates, notable for the battle, 401 B.C., between Artaxerxes Mnemon and Cyrus the Younger. Xenophon tells the story in his *Anabasis*.

Cundinamarca, dep. of Colombia, extending from the Magdalena to the Orinoco. The llanos to the e. occupy four-fifths of the area, and feed a large number of cattle. The

department also contains salt, copper, and coal mines, and has a few industries, such as tanning, distilling, brewing, and brickmaking. Bogotá is the chief center of importation; p. 600,000.

Cuneiform, the name for the style of writing which was commonly in use, in ancient times, in Babylonia and Assyria. When the early users of the script entered Babylonia, they found themselves in a country abounding in clay; and instead of scratching the characters on the surface, they impressed them, line by line, with the edge of a stick cut perfectly straight, the portion formed with the end of the stick or stilus having a tendency to become impressed deeper than the rest. Lines thick at the top and on the left became the rule, giving birth to a series of characters formed of cones or wedges called by the Akkadian and Semitic Babylonian users of the script 'fingers.' With what nation the cuneiform system of writing originated admits, in the opinion of most Assyriologists, of little or no doubt. The characters were originally hieroglyphics, and these have meanings agreeing with the words of the Sumerian language.

The Sumerian system of writing, as it has been handed down to us, was: to express all nouns and verbs by means of ideographs, certain characters, used syllabically, being employed to show the relations of case, and the subject, object (both direct and indirect), and number of the verbs. As the ideographs often stand for several words of similar meaning, a character used syllabically as 'phonetic complement' generally indicates which word to read. When used in Semitic, Babylonian or Assyrian the system is similar, but differs on account of the different nature of the language for which it is employed.

The cuneiform system of writing spread first to Elam, which was in the early times a Babylonian province. It was also used at an early date in Cappadocia and the neighborhood, spreading southward (or westward from Babylonia) to the e. Mediterranean coastlands generally. Assyria, having been a Babylonian colony, naturally adopted the script, and from the Assyrians the ancient Armenians borrowed it, somewhat modifying the form. It will thus be seen that it was the principal means of communication and the chief literary vehicle. By its means Babylonian literature must have become known, through the scribes, to the people of those districts generally. However, before the in-

comparably simpler alphabet known as Phœnician the exceedingly complicated system of writing of the Babylonians and Assyrians was bound to give way. After the period to which the Tell-el-Amarna tablets belong no native cuneiform inscriptions were, to all appearance, produced in Palestine and its neighborhood. The Aramaic form of the so-called Phœnician appear in Syria about the 8th century B.C., and spread to Babylonia and Assyria, but it never took the place of cuneiform so long as the independence of those countries lasted. When the script finally ceased to be used is unknown. The origin of the alphabet of the old Persian scribes has still to be found. To all appearance it had an independent origin, the writing of the characters with wedge-shaped lines being due to Babylonian influence, and also, like the script of Babylonia, to the convenience of this system for writing on clay tablets, and its suitability for monumental inscriptions.

The great importance of old Persian cuneiform is that, being the simplest of the three scripts in use in the dominions of the Persian kings, it was the means whereby Grotefend, at the beginning of the 19th century, laid the foundation of cuneiform decipherment. Taking the words for Darius, Xerxes, 'great,' 'king,' etc., in the Persian inscriptions, he read into them their ancient Persian forms, and, by comparing the consonants, found himself in possession of a portion of the Persian cuneiform alphabet. Grotefend was followed by Burnouf, 1836, a learned Zend scholar, Lassen, and others. The material acquired by Sir Henry Rawlinson when, in 1836-7, he took paper impressions of the great inscription of Darius at Behistun, gave him a great advantage over other scholars. See Rogers, *History of Babylonia and Assyria*, 1915; E. A. W. Budge, *Rise and Progress of Assyriology*, 1925; and papers in *The Journal of the Royal Asiatic Society*.

Cunene, river in Angola, Portuguese W. Africa, rises on the plateau of Benguela and flows through Mossamedes to the frontier of German s.w. Africa, where it turns westward to the sea.

Cuneo. (1.) Province of N. Italy, belonging to Piedmont. Cattle breeding is of great importance, and cheese is made. There are several mineral springs, as at Valdieri; p. about 638,235. (2.) Town and episc. see of Italy, cap. of above prov.; has a (restored) cathedral, a 12th-century church, and narrow streets, with mediæval houses. The people make silk, cotton, and paper. Owing to

its strategic position, commanding the passes over the Maritime Alps, Cuneo was formerly fortified and was several times besieged; p. 36,419.

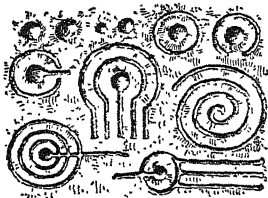
Cunha, Tristao da Cunha (1460-c. 1540), Portuguese navigator. In 1506 he discovered in the South Atlantic the island which bears his name.

Cunningham, Sir Alexander (1814-93), English writer on Indian archæology, Indian architecture, and statistics, including *Archæological Survey of India* (1871).

Cunningham, Allan (1784-1842), Scottish poet and biographer. In 1813 he published *Songs, Chiefly in the Rural Dialect of Scotland*. In 1822 he published his drama *Sir Marmaduke Maxwell*, and was the author of numerous other works. See D. Hogg's *Life of Cunningham* (1875); Lockhart's *Scott*; Sir W. Scott's *Journal*.

Cunningham, William (1805-61), Scottish divine; one of the leaders of the 'non-intrusion' party in the Church of Scotland. Principal of the New (Free Church) College. In 1842 he had received the degree of D.D. from Princeton College—his only degree. Cunningham gained extraordinary influence, especially over his students. See *Life* by Rainy and Mackenzie.

Cuoco, or Coco, Vincenzo (1770-1823), Italian historian. In 1804 he published *Platone in Italia*, a history of Italy in the form of a novel, which had a great success. He returned to Naples in 1806. See D'Ayala's *Vita di Vincenzo Cuoco* (1865).



Cup-and-Ring Markings.

Cup-and-Ring Marks, a term in archæology applied to mysterious designs found on rocks and stones in many parts of the world, produced by picking with sharp-pointed tools. No theory hitherto advanced explains their origin, purpose, or meaning.

Cupellation, a method of assaying gold and silver. The process depends on the fact that oxides of metals are soluble in litharge (PbO) when fused in contact with it; non-

oxidizable metals being, however, insoluble.

Cupid, the Roman god of love, equivalent to the Greek Eros, represented in paintings and sculpture as a nude boy, winged, blind, and armed with a bow and quiver of arrows, which he aims at the hearts of lovers with the object of kindling their desires.

Cupola, a concave or polygonal ceiling, originating in Roman and Byzantine architecture. Sometimes also applied to any small dome on a domestic building, sometimes with windows.

Cupping, in surgery, is a method, now almost never used, of drawing blood in cases of deep-seated congestion to the surface of the body, performed by heating the interior of a glass vessel and then swiftly applying the vessel to the affected part, damped, so as to produce a partial vacuum inside the former. This, through atmospheric pressure, causes the skin to lift and the serum to accumulate.

Cupric Salts. See **Copper**.

Cuprous Salts. See **Copper**.

Cura, chief town of prov. Miranda, Venezuela; a trading station between Carácas and the llanos; p. 12,000.

Curaçao, an easily-prepared liqueur, many imitations of which are now on the market. It is manufactured chiefly in Holland and in Great Britain, from the essential oils and extracts of the peel of the Curaçao orange.

Curaçao, or **Curaçoa**, a colony of the Netherlands, in the W. Indies, consisting of the islands of Curaçao, Bonaire, Aruba, and the southern part of St. Martin, St. Eustatius, and Saba. Capital, Willemstad, on the s. coast of Curaçao. Curaçao has belonged to the Netherlands since 1682.

Curare, **Urari**, or **Woorali**, is a dark-brown substance extracted from plants of the *Strychnos* species, and containing curarine. It paralyzes the motor nerves of the voluntary muscles.

Curassow, a name given to a number of large American game-birds belonging to the genus *Crax*.

Curate, literally one who has the cure of souls; but by the end of the 16th century the term was used rather of the 'substitutes,' or assistants of the parish priests.

Curb, a ring of wood or iron which forms a base to the masonry of wells, shafts, side-walks, or the piers of bridges.

Curci, Carlo Maria (1809-91), Italian theological writer. A publication urging the reconciliation of the Holy See with Italy caused his expulsion from the Jesuit order

by Leo XIII. (1877). He also adopted principles closely akin to Christian socialism, which led to his excommunication. But he retracted, obtained absolution from the pope, and, retiring to Careggi, he wrote his autobiography: *Memorie di Padre C. M. Curci* (1891).

Curé, one who has the cure of souls; the name commonly given to a Roman Catholic priest in France or in a French-speaking country.

Cures, anc. tn. of the Sabines, near the modern Corrèze.

Curetes, a name given to priests of Zeus in Crete; they are said to have watched over Zeus in his infancy.

Cureton, William (1808-64). English Syriac scholar. Cureton did his most valuable work by his discoveries among the mss. brought from the Nitrian valley to the British Museum of the famous epistles of St. Ignatius to Polycarp and some fragments of a Syriac version of the gospels.

Curfew was introduced from the Continent into England by William the Conqueror. The curfew bell was rung at sunset in summer, and at eight o'clock in winter. At this bell all fires were put out and all lights extinguished, and the formal sounding of the curfew bell has continued in some districts to this day.

Curico. Province, Chile, on coast; has copper and gold mines. It is very fertile; p. 14, 577.

Curie, Pierre (1859-1906) and **Skłodowska**, his wife (1867-1934), discoverers. Madame Curie, (b. at Warsaw), was a pupil of Pierre Curie before she married him at the old Sorbonne in Paris, where he was professor of physics. Together they carried on intensive research on uranium which resulted in 1902 in the discovery of radium. M. Curie



Curlew.

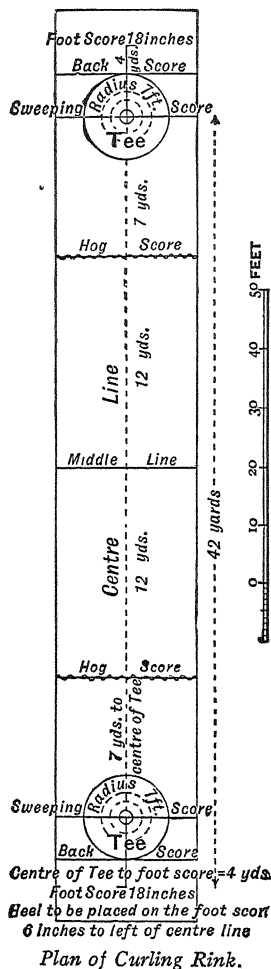
became chief professor of physics in the faculty of sciences, Paris University, and on November 22, 1908, Madame Curie was appointed to be his successor in the university chair.

Curio, Gaius Scribonius (c. 84-49 B.C.), son of Gaius Scribonius, consul in 76 B.C.,

and, like his father, a friend of Cicero.

Curityba, or **Curitiba**, cap. of Parana, Brazil, on the high tableland. It contains match and other factories; p. 78,986.

Curius, **Manius Dentatus** (d. 270 B.C.), a hero of the best days of the Roman republic, in his second consulship completely defeated Pyrrhus.



Curlew, a limicoline bird of the genus *Numenius*, with a long decurved bill and much-elongated legs, which is found very frequently on the shore between tide marks.

Curley, **Michael Joseph** (1879), archbishop, born Golden Island, Athlone, Ireland. Degree of A.B., Royal U. of Ireland, was

followed by study in Rome. Ordained a R.C. priest, 1904; missionary in Florida, 1904-14; bishop of St. Augustine, 1914; archbishop of Baltimore to succeed Cardinal Gibbons, 1921.

Curling. For three centuries the home of curling has been in Scotland, where clubs are numbered by the hundred; but it is popular also in some parts of Canada, the United States, and a few other countries. A 'rink' of smooth, keen ice having been chosen, the curler makes a tee at each end, the tees being connected by a straight line drawn on the ice. A circle of three inches radius is described at each end of the rink. On this tiny circle every right-handed player must place his left foot. A similar circle must be drawn, if need be, for the convenience of left-handed players. At a distance from each tee, usually reckoned as one-sixth of the length of the rink, a *wavy* line is drawn, which bears the name of the 'hog score'; and precisely at the center of the rink a *straight* line is drawn, called the 'middle line.' It is necessary to repeat everything save the middle line in duplicate, for the reason that the game is played from each end alternately. Every stone that does not cross the hog score is treated as 'dead,' and removed from the ice.

The rink having been prepared, the skip, or captain, makes up his team (four a side in matches), and play begins. Each player has a broom, and two curling stones. There are eight ways in which scoring is made, and the highest possible score is 72. The first player on a side stands back of the tee, and sends the stone along the ice to the other tee, and the other players follow in turn. Every stone within the 7-ft. circle is counted, and the highest score wins. The brooms are used to sweep clear the path of the stone. For details of rules, etc., see Spalding's Athletic Library on *Curling*.

Curragh, common, Co. Kildare, Ireland. Originally granted as a race-course by George IV., the plain remains the property of the crown, and has four annual race meetings.

Curran, Charles Courtney (1861-1942), American painter. Awarded various prizes, among them the Carnegie from the Society of American Artists; the Altman from National Academy of Design. *The Dream* is among his works.

Curran, John Philpot (1750-1817), Irish orator and politician, one of the leaders of the band of honest men under Grattan who opposed the Union. He distinguished himself as

defence lawyer in state trials. See Lecky's *Leaders of Public Opinion in Ireland*.

Currant. The currant is a common bush-fruit, extensively grown in gardens in Europe, America, and in other countries having a temperate climate. The red and white varieties (*Ribes rubrum*) are the varieties chiefly grown for canning, jelly, and dessert purposes. The currant of commerce is a small raisin, which is an important product of the regions of the Eastern Mediterranean.

Currency, a popular general word with little scientific definiteness, often used as a synonym of 'money,' or as an equivalent for paper money only. By derivation it means that money which is continually passing from hand to hand. When the expression 'Currency Reform' is used, it is intended to refer to the reform of an entire monetary system. See COINAGE.

Current, Electric. See Electricity, **Current**.

Current River, a tributary of the Big Black River, rising in Texas co., Missouri, through Missouri, and into Arkansas.

Currents, Atmospheric. See Meteorology.

Currents, Oceanic. See Ocean.

Curriculum, the name for the course of study in any educational institution. Efforts have been made by associations of colleges and by special commissions to exact uniformity in college entrance requirements, which would compel uniformity in the secondary curriculum. The practical work accomplished in that direction by the College Entrance Examination Board has been recognized in the acceptance of the Board's uniform examinations by the colleges of the United States. In general there are two aspects of the curriculum: that of content and of organization. These are the chief subjects of educational discussions. There are also in a college *extra-curricular* activities—organized but not essential to a degree—such as football. Important reports on curriculum problems are issued in America by committees appointed by the National Education Association.

The basis of the original curriculum was the Seven Liberal Arts of the Middle Ages. Since then in every college the tendency has been not only to extend the content of the curriculum, but also to extend the choice in subjects required for a degree. In the high school and college the use of the elective system, of which former President Eliot, of Har-

vard, was the most consistent and uncompromising advocate. has extended with the extension of the curriculum. It was first used in the University of Virginia (1825), during the next 40 years was fostered at Harvard, which in 1869 declared in its favor without restriction; and was the method under which Cornell was founded (1867). The study of the history of education has shown that education to be most efficient which best adapts itself to the needs of its time, and best embodies the highest contemporary thought. The recognition of this fact makes impossible, for the future, a fixed curriculum of any kind: especially one that, like the classical programme, devotes itself entirely to the study of antiquity. See EDUCATION; VOCATIONAL EDUCATION; INDUSTRIAL EDUCATION.

Consult Monroe's *History of Education*; Payne's *Elementary School Curricula*; Eliot's *Educational Reform*; Snow's *College Curriculum in the United States*; Eliot's *Academic Freedom*; Draper's *American Education*; Birdseye's *Reorganization of Our Colleges*; Ordahl's *College Curricula*.

Curry, John F. (1873-). politician, was born in County Fermanagh, Ireland, and brought by his parents, when very young, to New York City. Since 1910, in insurance, head of John F. Curry Agency, Inc. Member N. Y. Assembly 1903-04; member excom. Tammany Hall 1905-29; commr. of records, surrogate's court 1911-29; head of Tammany Hall, 1929-34.

Curry, Samuel Silas (1847-1921), American educator, professor and lecturer on elocution and art at Boston University, and elsewhere. He was the founder and president of the Boston School of Expression. His publications include *Spoken English* (1913).

Curry Powder, or **Curry Paste**, a compound of various spices used as a seasoning.

Cursor Mundi ('Courier of the World'), a long religious poem written in Northumbrian English about 1320 A.D.

Curtea de Arges, town and episcopal see, Roumania. Among its churches is one of the finest specimens of Byzantine architecture extant; p. 4,000.

Curtsey, in law, tenancy by curtesy is the life estate which a husband may enjoy in all his wife's real estate of which she was the absolute owner during the marriage, if she dies without having disposed of it by will or otherwise, and there has been issue born of the marriage.

Curtin, Andrew Gregg (1817-94), American public official. He is remembered chief-

ly as governor of Pennsylvania during the trying Civil War period. After the war he was United States minister to Russia, 1869-72; and was a Democratic member of the National House of Representatives, 1881-7.

Curtin, Jeremiah (1840-1906), American author, best known through his translation of works of Sienkiewicz and Tolstoy

Curtis, Benjamin Robbins (1809-74), American jurist. In 1851-7 he was an Associate Justice of the U. S. Supreme Court, his dissenting opinion in the Dred Scott case being probably the ablest and most cogent argument ever written against the decision of the court in that case. He was one of President Johnson's counsel in the impeachment trial before the United States Senate.

Curtis, Charles (1860-1936), American public official, was born in North Topeka, Kan. His maternal grandmother was one-half Indian. He was Representative in Congress in 1893-1907, and was elected U. S. Senator for the unexpired term of J. R. Burton. In 1928 he was chosen Vice-President of the United States on the Republican ticket.



Cyrus H. K. Curtis.

Curtis, Cyrus Hermann Kotschmar (1850-1933), American publisher. The Curtis Publishing Company, of which he became head, owns the *Ladies' Home Journal*, *Country Gentleman*, and *Saturday Evening Post*. In 1913 he took over the Philadelphia *Public Ledger*, and later the New York *Evening*

Post. In all of these circulation expanded under his management. In 1924 he founded the Curtis Institute of Music, Philadelphia, of which Josef Hofmann became director.

Curtis, George Ticknor (1812-94), American lawyer and legal writer. He was born at Watertown, Mass. As U. S. commissioner in Boston in 1851, he rendered the decision returning Thomas Sims, a fugitive slave, to his master, which brought Curtis much ill-will from the Abolitionists. He wrote much for the press, and in addition to his legal writings he was the author of the important *Constitutional History of the United States*.

Curtis, George William (1824-92), American author. Curtis's life at Brook Farm and at Concord brought him into contact with the eminent group of writers connected with those places. In 1846 he visited Europe, living for some time in Germany and Italy, and afterward travelling through Egypt and Syria. The publication of his *Nile Notes of a Howadji* (1851) and *The Howadji in Syria* (1852) brought him into prominence, and these books were followed, in 1852, by *Lotus-Eating*, a collection of letters describing his experiences at various American watering-places. He began work as a lecturer in 1853, and was one of the most popular of the old group of 'lyceum' lecturers. In 1853, also, he became associated with Messrs. Harper & Brothers, the publishers, as editor and author, maintaining this connection until his death, during which period he contributed the editorial section known as 'The Editor's Easy Chair' to *Harper's Monthly*. On the establishment of *Harper's Weekly* in 1857, he became chief editorial writer for that periodical, and vigorously supported the cause of the Union. In 1880 he became president of the N. Y. Civil Service League. He was chancellor of N. Y. University. His *Potiphar Papers* (1853), were an amiable satire on the fashionable follies of the day. Other works were *Prue and I* (1856); *Trumps*, a novel. See *Life*, by Edward Cary (1894).

Curtis, Samuel Ryan (1807-66), American soldier. He was commissioned brigadier-general of volunteers and gained a notable victory over Confederate forces at Pea Ridge, Ark., in March, 1862.

Curtis, William Elleroy (1850-1911), American journalist, born at Akron, O.; he went to Washington in 1887 as correspondent of the *Chicago Record*, and later of the *Record-Herald*. He went to South and Central American countries on diplomatic missions, and was director of the Bureau of American

Republics (1890-3). He wrote many books of travel, description, biography, and popular economics.

Curtiss, Glenn Hammond (1878-1930), aviator, born at Hammondsport, N. Y. In a motorcycle of his own construction he made the fastest record for any vehicle on land. On July 17, 1908, at Hempstead Plains he made a record by flying 52 minutes. At Rheims he won the Gordon Bennett trophy and the Grand Prize for speed by flying 46 m. per hr. He used a bi-plane of his own designing. After a record-breaking flight from Albany to New York that won the New York World prize in 1910, and after winning various cups and prizes in airplane contests, in 1913 he was awarded a medal by the Smithsonian Institution. In 1914 he designed *America*, the first multi-motored flying boat designed for trans-Atlantic flight. He developed the Wasp motor. He expanded his factories to meet war demands. In 1919, his U. S. Navy flying boat No. 4 was the first aircraft to cross the Atlantic. He organized the Curtiss Flying Service and Schools, and wrote the *Curtiss Flying Book*, with Augustus Post.

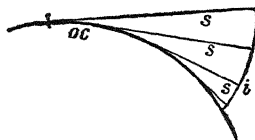
Curtiss Turbine. See *Turbines*.

Curtius, Ernst (1814-96), German classical philologist and scholar, born at Lübeck. He wrote many works, among which are his *Classical Studies* (1840).

Curtius, Georg (1820-85), German philologist and Greek scholar, brother of Ernst Curtius. Among the best of his works are his *Griechische Schulgrammatik*, 1852; Eng. trans 1863.

Curtius, Rufus Quintus, a Roman historian of Alexander the Great; he lived probably in the 1st or 2d century A.D. His history consisted originally of ten books. See Dosson's *Etude sur Quinte Curce* (1887).

Curule Chair, the Roman state chair, was ornamented with ivory, and had curved, crossed legs.



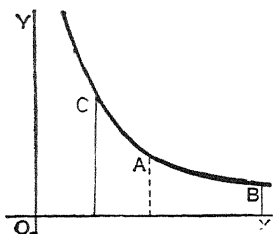
Involute of a Curve.

oc, Original curve; s, string at different stages; i, involute.

Curve, as ordinarily understood, is any continuous line which is neither straight nor

built up of straight parts. Any three points on the curve determine a plane. Imagine an inextensible string to be laid along any plane curve and gradually uncoiled in a tense state. The end of the string will trace out a curve which is called the *involute* of the original curve.

Curve-tracing. Any algebraic relation between two quantities which are subject to continuous change can be represented as a plane curve.



Curve-tracing.

Curwen, John (1816-80), promulgator of the tonic sol-fa system of music.

Curzola. (1.) The ancient *Corcyra Nigra* of Austria, chief town of the island of Curzola. Here, in 1298, the Genoese took prisoner the traveller Marco Polo. (2.) Island of the Adriatic, belonging to Austria, situated on the Dalmatian coast; p. about 18,749.

Curzon, George Nathaniel, Lord Curzon of Kedleston (1859-1925), English statesman; reform viceroy of India. The British mission to Tibet was the chief event of his rule, 1904. (See *TIBET*.) June, 1905, Lord Kitchener denounced the system of dual control in the Indian army, and his view, opposed by Lord Curzon, was supported by England. Curzon resigned Aug. 12, 1905, and in 1919 succeeded Mr. Balfour as Secretary of State for Foreign Affairs. Consult Lipsett's *Lord Curzon in India* (1903).

Curzon Line, a line through Poland, about 100 m. e. of Warsaw, accepted, 1919, by the Supreme Council of Allied Powers, but rejected by Poland; suggested by Lord Curzon, who sought to establish ethnographic frontiers for the new Polish state. In 1944, Russia suggested this line, or near it, as a boundary between herself and Poland.

Cusa, Nicolaus of, proper name **Chryppfs** (1401-64), German theologian, cardinal. His chief work was *De Docta Ignorantia*. In 1436 he proposed reform of Julian calendar, defined rotation of earth around the sun, etc., and directly influenced Giordano Bruno.

Cushat, or **Cushie Doo**. A Scotch name for the wood pigeon. See *RING DOVE*.

Cushing, Caleb (1800-79), American politician and lawyer. His historical and legal articles in the *North American Review* attracted attention, and he was several times elected to the state legislature. As U. S. Commissioner to China, 1843-5, he concluded the first treaty of the United States with that country. He was appointed judge of the supreme court of Massachusetts, 1852, was attorney-general of the United States, 1853-7, and was appointed one of three commissioners to codify and revise the laws of Congress (1866). In 1874-7 Cushing was U. S. minister to Spain. He also wrote *The Practical Principles of Political Economy* and *The Growth and Territorial Progress of the United States* (1829); see *Memorial of C. Cushing* (1880).

Cushing, Frank Hamilton (1857-1900), American ethnologist. Among his writings are *The Myths of Creation*; *The Arrow*; *Preliminary Report of the Pepper-Hearst Expedition on the Ancient Key-Dwellers of Florida*; and numerous reports.

Cushing, Harvey Williams (1869-1939), U. S. surgeon, professor, and biographer; grad. Yale, 1891; Harvard Medical School, 1895; associate prof. surgery, Johns Hopkins, 1902-12; prof. surgery, Harvard, 1912-32; prof. neurology Yale, 1932-37; emeritus thereafter. Published *Life of Sir William Osler*, which won Nobel prize, 1926, and *From a Surgeon's Journal* (1936). Was considered greatest U. S. brain surgeon. His daughter, Betsey, married James, oldest son of Pres. Franklin D. Roosevelt.

Cushing, Luther Stearns (1803-56), American legal writer. He served four years as common pleas judge at Boston, and in 1850 was appointed reporter of the Massachusetts supreme court, holding office until his death. Besides his reports, he published several special treatises. His *Manual of Parliamentary Practice*, 1845, became a standard guide.

Cushing, Thomas (1725-88), American revolutionary leader. He was a member of the Massachusetts Provincial Congress and of the Continental Congress and was lieutenant-governor, 1779-88, acting as governor in 1788.

Cushing, William Barker (1842-74), American naval officer, is remembered chiefly for his destruction, in 1864, of the formidable iron-clad Confederate ram *Albemarle*.

Cushman, Charlotte Saunders (1816-76), American actress, made her debut as Lady Macbeth in New Orleans in 1835.

Cushman, Robert (c. 1580-1625), an Eng-

lish merchant, one of the founders of the Plymouth colony in America. He emigrated to Plymouth in the *Fortune*, but subsequently returned to England as the representative of the colonists.

Cusk, an inferior sort of cod (*Brosmius brosme*).

Cusp (*cuspis*), a projecting point dividing the window head of the lancet light into a form resembling a trefoil leaf.

Custard Apples, or *Anonas*, are a genus of tropical evergreen shrubs and trees, with sweet-scented leaves and fleshy edible fruit.



Custard Apple (*Anona reticulata*).

1, Flower, three outer petals removed; 2, fruit and section.

Custer, George Armstrong (1839-76), American soldier, was born at New Rumley, O., and was graduated from West Point in 1861. His energy and gallantry in action brought him quick promotion in the Army of the Potomac, in all of whose battles, save one, he participated. After the war Custer served in the West, principally engaged in suppressing uprisings of the Indians. In 1876 he and his regiment took part in the campaign begun by Sheridan against Sitting Bull, then in the Yellowstone region with about 6,000 Indians, only to be surrounded by Sitting Bull's entire force and shot down with his company to the last man.

Custis, George Washington Parke (1781-1857), American writer, was born at Mount Airy, Md. He was the adopted son of

George Washington, and the grandson of Mrs. Washington by her first marriage. He is remembered chiefly for his *Recollections and Private Memoirs of Washington*.

Custom House, an office established by the government in a port of entry for the collection of customs duties and the clearance of vessels. In the United States custom houses are under the jurisdiction of the Secretary of the Treasury, each custom house being in charge of a *collector of customs*, appointed by the President with the approval of the Senate, and charged with the enforcement of the customs regulations. Regulations for the custom house examination of baggage are most minute. Every person entering the United States is required to make a declaration and entry of his personal baggage. After the baggage has been landed the declaration is verified by examination, dutiable articles are passed to the appraiser, or the officer acting as such, for valuation, and the rate of duty is determined accordingly. Passengers dissatisfied with values placed upon dutiable articles by the customs officers on the pier may demand a re-examination, application for which should be made to the officers in charge immediately. Appeal from the decision of the local appraiser may be made to the Board of General Appraisers, which is a last resort on questions of value, but from which appeal may be taken on questions of procedure or classification to the Court of Customs Appeals (see CUSTOMS APPEALS, U. S. COURT OF).

Customs Appeals, U. S. Court of, a court created by the Payne-Aldrich Tariff Act of 1909 to 'exercise exclusive appellate jurisdiction to review by appeal the final decisions by a board of general appraisers in all cases as to the construction of the law and the facts respecting the classification of merchandise and the rate of duty imposed thereupon.' Its decrees are final except in certain cases reviewable by the Supreme Court.

Customs Duties. The term 'customs' was anciently used in a wide sense for customary payments or dues of many kinds, until in process of time it was restricted to the duties of certain articles of commerce.

Customs Union, often called by its German name of *Zollverein*, is a commercial league entered into by different states, by which reciprocal free trade and a uniform tariff on articles imported from outside are agreed upon.

Custos Rotulorum, in England, is an offi-

cer appointed by the crown in each county, nominally for the purpose of *keeping the rolls*, a purely honorary position.

Cutaneous Sensations are sensations aroused by adequate stimulus of the skin, without accompanying stimulation of the joints, tendons, muscles, or other sense organs. Their physiological basis is apparently to be found in the different sets of nerve endings irregularly distributed over the area of the skin, giving rise to especially sensitive spots. Various sensations have been classified under this heading. Of these only four—pressure, cold, heat, and pain—are strictly cutaneous. Cold spots are unaffected by heat, and heat spots by cold. Pain spots are the most closely distributed of all.

Cutch, or **Kachh**, feudatory state in Gujarat, Bombay, India; p. about 487,547. The territory is treeless, barren, and rocky.

Cuthbert, town, Georgia, county seat of Randolph co.; seat of Andrew Female College and the Southwest Georgia Agricultural College. Industries include cotton products, ice, and fertilizers; p. 3,447

Cuthbert, St. (7635-687), English saint, born, as is now generally believed, in Northumbria. St. Cuthbert became an anchorite, and left Lindisfarne (676) for a lonely hut on one of the Farne Islands. Cuthbert was one of the strictest of ascetics. For centuries his shrine at Durham—where his remains found their last resting-place in 1104—became a great center of pilgrimage. In 1826 his grave was opened. See Bede's *Life of St. Cuthbert* (trans. Stevenson, 1887); J. Raine's *St. Cuthbert* (1828); C. Eyre's *Hist. of St. Cuthbert* (1849); A. C. Fryer's *Cuthbert of Lindisfarne* (1880).

Cutlass, **Cutlass**, or **Courtelas**. A cutting weapon once used by sailors; has a flat, wide, slightly-curved blade.

Cutler, Manasseh (1742-1823), American clergyman and legislator, born at Killingly, Conn. He was a man of unusual versatility—among other things he was a practising physician—and was in particular a scientist of considerable attainments. Consult W. P. and J. P. Cutler, *Life, Journals and Correspondence of Manasseh Cutler* (2 vols., 1888); and Poole, *The Ordinance of 1787 and Dr. Manasseh Cutler as an Agent in its Formation* (1876).

Cutlery, originally cutting implements of every shape and description. In modern use the term has been both widened to include forks, and restricted by the exclusion of many kinds of edged tools; such as saws, chisels, etc.

Cutlips, a fish, one of the suckers (*Lagochila lacera*) of the lower Mississippi Valley.

Cuttack, cap. of a district in Orissa, Bengal, India; noted for it filigree work in gold and silver; p. 51,364,

Cutter, a small vessel with a single mast, a mainsail, a forestaysail, and a jib set to bowsprit end. The term 'revenue cutter' is applied to the vessels of the U. S. Revenue Cutter Service, a number of which are steam vessels of substantial size.

Cutter, George Washington (1801-65), American poet. 'The Song of Steam' and 'E Pluribus Unum,' are the best known of his poems.

Cutting, Robert Fulton (1852-1934), American politician. He took an active part in the politics and sociological work of New York city, as president of the Citizens' Union, the Association for Improving the Condition of the Poor, and the New York Trade Schools.

Cuttings of a plant are parts which are separated from the parent by means of the knife, and are capable, when placed under suitable conditions, of developing into individuals resembling the parent plant. These conditions usually include a moist atmosphere and a porous soil, and in most cases bottom heat. Stem cuttings are composed either of hard ripe wood or of soft green wood. The latter are sometimes known as slips. Geraniums, carnations, and coleuses are among the plants usually propagated by means of soft wood cuttings. They should be most carefully selected, and should be neither too soft nor too old. Mr. Bailey suggests a very good test of the suitability of a green shoot for the purpose of propagation by cuttings. If upon being bent the shoot snaps off squarely so as to hang together with only a bit of bark, it is in proper condition; but if it bends or simply crushes, it is either too old or too young for good results. The cuttings are usually cut below a bud, though in some plants this is not necessary. They are planted in moist sand, and placed in a propagating frame, or elsewhere if the atmosphere can be kept from becoming dry. In propagating bush fruits and most trees, hardwood cuttings are usually chosen. These are best taken in early autumn and with a length of about six inches. They are best stored in the sand for the winter, and planted in the spring. Cuttings may also be obtained from the thick leaves of several plants—for instance, gloxinias and begonias. By pegging down the leaf of a rex begonia on moist sand in a propagating frame by

means of little wooden pegs, many plants will be found to arise from the various injured points. Gloxinias may be propagated by planting the leaf-stalk in sand, the blade of the leaf being left erect above the soil. Many underground stems, tubers, and roots may be divided, and the parts used as cuttings for propagating purposes. Bouvardias, horse-radish, dahlias, and dracanas are among the plants that are easily increased in this way. To secure the greatest amount of success with cuttings, a well-drained sandy soil is essential, and bottom heat is usually desirable.

Cuttles, or **Cuttle-fish**, a term sometimes used as synonymous with Cephalopoda, and sometimes restricted to certain of the forms with two gills and ten arms, as, for example, *Sepia officinalis*, the common cuttle or squid. Cuttles undoubtedly grow to a great size, and their strong parrot-like jaws and toothed suckers form weapons not to be despised; but such terrible forms as the 'kraken' of Victor Hugo's tales are mythical. Cuttles are widely distributed in the oceans of the world, especially in deep water. In many instances the flesh is eaten, the ink of the ink-bag is used to some extent to furnish the pigment sepia. See A. H. Cooke's *Molluska* (1895).

Cuttyhunk, the most s.w. of the Elizabeth Islands, off Buzzard's Bay, Mass. It was the site of a temporary settlement in 1602, the earliest in New England.

Cutworm, the name of various caterpillars, mostly of noctuid moths, which hibernate under ground, and in the spring eat the stems of grain plants and vegetables.

Cuvier, Georges Léopold Chrétien Frédéric Dagobert (1769-1832), French anatomist, who not only did much himself to advance zoology, but also founded a school which had a salient influence on the subsequent development of the science. His great book on the animal kingdom, *Le Règne Animal* (first published in 1816), summarized his observations, and for a long period was the standard book on zoology. He founded the modern science of palæontology, studying especially the Tertiary mammals of the Paris basin. He was the bitter opponent of all forms of speculation, and especially of the dawning evolutionism of his contemporaries, as was manifested in his controversies with Lamarck. See Haeckel's *Natürliche Schöpfungsgeschichte* (1868; Eng. trans. 1892); Lee's *Memoirs of Baron Cuvier* (1833); Carus's *Geschichte der Zoologie* (1864); J. A. Thomson's *Science of Life* (1899).

Cuxhaven, tn. in the territory of Hamburg, Germany. The Hamburg-American line transferred a great part of their staff from Hamburg to Cuxhaven in 1901; p. 20,000.

Cuyaba, cap. of Matto Grosso, Brazil: the palaces of the governor and bishop, the hospital, churches and arsenal are the chief buildings; p. 33,678.

Cuyahoga Falls, vil. Summit co., O., manufactures include machinery, forgings and castings, etc.; p. 20,874.

Cuyler, Theodore Ledyard (1822-1909). American Presbyterian clergyman, born at Aurora, N. Y. He was a prolific writer of religious works and of articles in religious papers, and was active in philanthropic, civic, and temperance movements.

Cuyo. 1. Pueb., Philippines, cap. of Paragua prov., 257 m. s. of Manila; 2. Isl., Philippines, largest of its group.

Cuyos, The, isl. group, Paragua prov., Philippines. There are 47 isls. of volcanic and coral origin. Cuyo is the only one that is fertile.

Cuyp, Albert (1620-91), Dutch painter, born at Dordrecht. Albert has been called 'the Dutch Claude.' because, according to Ruskin, 'for expression of effects of yellow sunlight, parts might be chosen out of the good pictures of Cuyp which have never been equalled in art.' England first recognized his genius, and possesses most of his works. He is represented also in the Metropolitan Museum, New York City. Consult Timothy Cole's *Old Dutch and Flemish Masters*.

Cuyuni River, British Guiana, a branch of the Essequibo.

Cuzco, city and episcopal see, Peru, capital of the department of Cuzco. It is built on the ruins of the ancient Inca city of Cuzco founded in the 11th century and practically destroyed by Pizarro in 1536. The Friary of Santo Domingo occupies the site of the magnificent Temple of the Sun. Maize, barley, coffee, cocoa, coca, and sugar cane are grown and quantities of coca leaves are exported; p. 35,000.

Cuzco, department in the southeastern part of Peru. It is watered by the Apurimac, Urubamba, Paucartambo and Purus Rivers. Agriculture is the leading industry, coffee, sugar, cocoa, and coca being the chief products. Copper, coal, gold, and iron occur, but owing to lack of transportation facilities, few mines are in operation. There is a home industry in weaving and knitting; p. about 700,000.

C. W. A., Civil Works Administration, see U. S. HISTORY, NEW DEAL.

Cyanamid, a commercial nitrogenous fertilizer of which the principal ingredient is calcium cyanide.

Cyane, in Greek legend, a Sicilian nymph, the playmate of Persephone. She wept herself into a fountain from grief.

Cyanæ Rupes, the Cyanean rocks, were two rocky islets which stood, according to Greek legend, in the Black Sea, not far from the mouth of the Bosphorus

of the sky. It consists of a circle of paper divided into sections tinted with blue and numbered from 0° to 52° , varying from the color of solid indigo gradually through the whole series to colorless at zero. The card is held in such a way that a full light falls on the pattern, and it is then turned until the tint of some number is decided on as the nearest to that of the sky.

Cyanophycæ, one of the four great



Cuzco, Peru.

The ancient Inca throne carved out of the solid mountainside, facing the rising sun and overlooking the great Inca fortress that protected Cuzco from attack.

Cyanic Acid, NCOH , is a strongly acid liquid (sp. gr. 1.14 at 0°C .)

Cyanide of Potassium. See **Potassium**.

Cyanite, **Kyanite**, **Diasthene**, or **Sappare**, a sky-blue mineral, forming elongated flat, blade-like crystals, with a perfect cleavage.

Cyanogen, $(\text{CN})_2$, a gas prepared by heating mercuric cyanide. Cyanogen is chiefly important from occurring as an acid radical in a series of salts known as the cyanides, in which it plays a part not unlike a halogen. Hydrogen cyanide, or prussic acid, like most of the cyanides, is a deadly poison.

Cyanometer, an instrument invented by Saussure for comparing the various shades

groups of Algæ, known also as the **BLUE** or **BLUE-GREEN ALGÆ**.

Cyanosis, or **Cyanopathy**, a blueness of the surface of the body, particularly of certain parts, due to a deoxidized condition of the blood.

Cyanuric Acid, a chemical compound, $\text{C}_3\text{H}_3\text{N}_3\text{O}_3$, formed by heating urea until it ceases to give off ammonia.

Cyathea. See **Tree Ferns**.

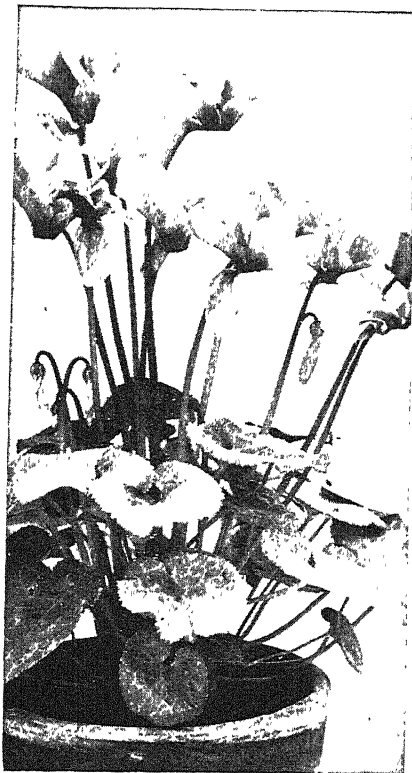
Cyaxares, a king of Media, reigned 634-594 B.C.

Cybele, a goddess whose worship was widespread in Asia Minor. She was regarded as the mother of the gods. Her worship was noisy and clamorous, her chariot being drawn

by lions and attended by the Corybantes. The Greeks identified her with Rhea.

Cycadaceæ, a natural order of small palm-like trees or shrubs found in the tropical and temperate regions of America and Asia and in Southern Africa and in Australia, occupying a place between the flowering plants and cryptogams.

Cycas, a genus of palm-like evergreen trees belonging to the order Cycadaceæ, and grown in greenhouses and window gardens.



Cyclamen.

Cyclades, a number of islands of the Grecian Archipelago. There are about 20 large and 200 small islands, the chief being Syra Andros, Tenos, Naxos, Kea, Melos, Delos, Serpho, and Thera. They are generally mountainous, poorly watered, and with the exception of Naxos, rather unproductive. Hermopolis is the capital; p. 129,702.

Cyclamen, a genus of perennial herbaceous plants, belonging to the order Primulaceæ. They are dwarf-growing plants. The

larger greenhouse cyclamens are *C. latifolium*, also known as *C. persicum*, with white and purple flowers and co-existent leaves in spring. From this species many beautiful varieties have been derived, which come fairly true from seed.

Cyclas, a genus of minute bivalve molluscs, the members of which are common in rivers.

Cycle (Gr. 'circle'), in chronology, a certain period of series of numbers, which regularly proceed from the first to the last, and then return again to the first, and so circulate perpetually. The solar cycle is a period of 28 years, in which the same days of the week recur, and the Sunday or dominical letter recurs in the same order. The lunar cycle is a period of 19 years, in which the new or full moon recurs on the same days of the month. It is also called the golden number, and the metonic cycle, after its discoverer Meton.

Cycling, the use of a bicycle or a tricycle as a means of locomotion. As early as 1808 a two-wheeled vehicle had appeared in Paris, with a connecting bar carved into some faint resemblance to a horse, whence it was called 'hobby-horse.' History is silent as to its inventor; but an improved form was made at Mannheim in 1818, by Baron von Drais, a German, and introduced in London in 1819. Both these machines were propelled by the feet. Kirkpatrick Macmillan, a Scotch blacksmith, was the first to make it possible to preserve a continuity of motion on a balanced vehicle without touching the ground with the feet. The precise date of this invention has not been determined, but it was not later than 1840, and probably somewhat earlier. A copy of this machine, made by Gavin Dalziel in 1846, was exhibited at a London cycle show, and gained for Dalziel the title of the inventor of the safety bicycle. Later cranks and pedals were fitted to the front wheel by Pierre Lallement of Paris (c. 1864), and in 1869 the idea was adopted in England, as the 'bone-shaker,' which developed into the high bicycle. Tricycles of innumerable shapes and sizes were constructed on this plan, but all eventually gave place to the safety type, produced by J. K. Starley. The invention of the pneumatic tire by J. B. Dunlop in 1888 insured the permanent popularity of the 'safety,' and subsequent developments of detail converted it into a luxurious vehicle.

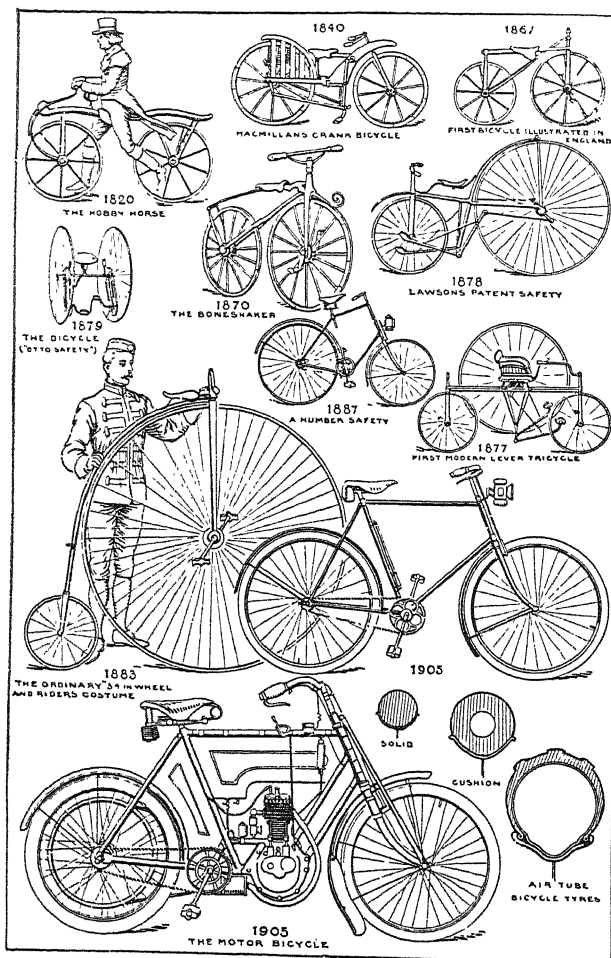
Cycles are classified as bicycles, tricycles, and quadricycles; having two, three, and four wheels respectively. Bicycles are single-track machines; tricycles are three-track machines;

quadricycles are two-track machines, the rear wheels driving and the front wheels steering. For motorcycles, see **MOTORCYCLES**.

Cycloid, the curve traced out by a point on the circumference of a circle which is rolling in its own plane along a straight line.

Cyclometer, an instrument used specially

from e. to w., but in higher latitudes from w. to e. Cyclones in tropical countries acquire great intensity, devastating the land, and in many cases causing loss of life. Consult Ward's *Practical Exercises in Elementary Meteorology*; Davis' *Elementary Meteorology*; Ferrel's *Treatise on the Winds*.



The Evolution of the Bicycle.

by cyclists for recording the distance ridden.

Cyclone, a violent rotary storm, usually occurring in tropical or sub-tropical regions, and distinguished by winds blowing around center or low pressure. Cyclonic areas travel at the rate of 20 or more miles an hour; the direction of motion in equatorial regions is

Cyclopædia. See **Encyclopædia**.

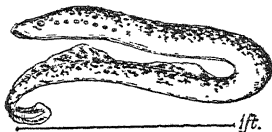
Cyclopaean Masonry, a name given to the rude walls of the ancient Greeks and Etruscans, built of huge blocks of unshaped rocks.

Cyclopes ('round eyed'), a race of monsters in Greek mythology, of vast stature and

strength, with a single eye, placed in the middle of the forehead. Their leader was Polyphemus, whom Odysseus blinded.

Cyclopteris, fossil leaves, usually circular or approximately circular in outline, without a median nerve, but with numerous radiate veins.

Cyclostomata, or **Round Mouths**, a small group of vertebrates, including the hag (*Myxine*), and the lamprey (*Petromyzon*). Animals often described as fishes, though in many respects simpler.



The Great Lamprey, one of the Cyclostomata.

Cyclotron, an apparatus designed to disintegrate atoms. Developed by Prof. E. O. Lawrence of the University of California, this machine is capable of gradually building up a tremendous amount of energy and shooting particles charged with this energy at atomic targets in a vacuum tube, thus causing them to disintegrate. Any kind of matter can be disintegrated in this apparatus. In 1936 the Carnegie Institute at Washington undertook to build a machine capable of developing and utilizing 15,000,000 volts of energy. Since it is difficult to control this tremendous store of energy, it is necessary to take special precautions for insulating the "atom smasher." The machine at Washington is housed in a specially reinforced chamber built into the side of a hill. A cyclotron under construction in Berkeley, Calif., will weigh when finished about 5,000 tons and generate 100,000,000 volts.

Cydnus, river in Cilicia, Asiatic Turkey, rises in Mount Taurus, and flows into the Mediterranean. The modern name is Sihun.

Cygnat. See **Swan**.

Cygnus, an ancient constellation situated between Draco and Pegasus, connected in classic times with the legend of Leda.

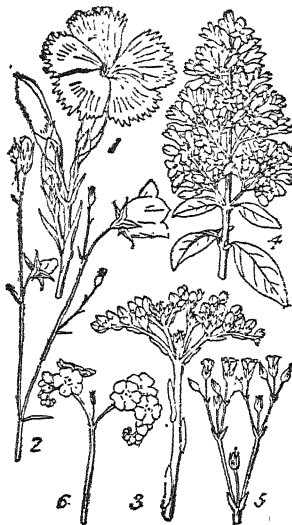
Cylinder, a solid traced out by a straight line moving round a given curve in such a manner that it always keeps parallel to its original direction. The cylinder is called elliptic, hyperbolic, etc., according as the curve is an ellipse, hyperbola, etc. In engineering the cylinder is one of the primary mechanical elements in numerous machines of motion. The

earliest form, in so-called "fire engines," operated by producing a partial vacuum beneath a piston. Later improvements by Watt produced double-acting cylinders in which steam drove the piston to and fro. Now multi-cylinders are used to a great degree in motors, airplanes, etc.

Cylene, a celebrated mountain of Greece in the Peloponnesus, the modern Ziria.

Cylon, an Athenian noble, who attempted to make himself master of Athens about 632 B.C.

Cymbals, a pair of thin circular plates of metal (copper and tin alloy) with a leather strap attached to each. The performer strikes them against each other with a frictional movement. In orchestra the cymbals usually have the same part as the bass drum, and are played by the same performer. They were used by the ancient Greeks in the worship of Cybele.



Forms of Cyme.

1. Pink. 2. Campanula (*race-mose*). 3. Stonecrop (*spicate*).
4. Privet (*panicled*). 5. Chickweed (*dichotomous*). 6. Forget-me-not (*scorpioid*).

Cymbeline, otherwise Cunobelinus, a king of Britain in the first century of the Christian era. His name survives on many coins, whose design shows Roman influence. He was the father of Caractacus.

Cyme, an inflorescence, or floral arrange-

ment, in which the terminal flower on the stalk is the first to open. In the simple cyme the lateral flower stalks spring from the same level on the parent stem, like the three prongs of a fork. Common examples are afforded by the pink, campanula, stoncrop, and privet. When two branches are given off by the flower stem below the terminal flower, and each of these stems, again, ends in a flower, below which two other branches are given off, a dichotomous cyme is produced, as in the chickweed. If, instead of two branches, one only is given off, from which one again in turn is given off on the same side, and so on several times, the result is a scorpioid cyme, as in the forget-me-not.

Cymogene, a distillation product of petroleum used in freezing machines to lower the temperature by rapid evaporation. Its boiling point is 32° F.

Cynewulf, (c. 730-c. 800), an Anglo-Saxon poet, probably a Northumbrian. The most personal passages of Cynewulf's poetry are the ones in which he has inscribed his own name in runic characters—*Juliana*, *Crist*, and *Elene*. Some of the *Riddles*, in the *Exeter Book*, are attributed to Cynewulf, and he was probably the author of some of the poems (see EXETER BOOK). For criticism consult Stopford Brooke's *English Literature to the Norman Conquest*; Morley's *English Writers*.

Cynics (Gr. 'doglike'), a school of ancient Greek philosophers founded by Antisthenes about 400 B.C. They professed contempt of riches, neglect of personal appearance and comfort, and usually a disbelief in virtue. Leading cynics were Diogenes, Menippos, Oniscritos, Crates, and Hipparchia. The name survives, with much of the original meaning.

Cynocephalus. See **Baboon**.

Cynodon, (*Cynodon dactylon*), the Bermuda or Bahama grass, is a low creeping grass with joined roots which grow rapidly in all directions. It is extensively grown for fodder in India.

Cynoidea, one of the three classes of the fissiped carnivores—the dog section. See CARNIVORA.

Cynosephalæ ('dogs' heads'), two hills in Thessaly, Greece, 15 m. southeast of Larissa. Here in 197 B.C. Philip v. of Macedon was defeated by the Romans under T. Quintus Flaminius, and had to sue for peace.

Cynosure (Gr. 'dog's tail'), a name sometimes given in astronomy to the constellation Ursa Minor.

Cynthia, one of the many names of the

Grecian goddess Artemis, the Roman Diana.

Cynthiana, city, Kentucky, county seat of Harrison co. It is located in a fertile district famous for its horses, and is an important tobacco market. It was the scene of a battle in the Civil War, June 11, 1864; p. 4,840.

Cyperus, a genus of rush-like plants of the order Cyperaceæ, bearing small spikes of bisexual flowers without calyx or corolla. Among the many species are *C. papyrus*, the Egyptian Paper Plant, which grows to about 6 ft. in height, and has a drooping mass of filiform bracts and umbel-rays, topping the tall stems (see PAPYRUS); and *C. alternifolius*, the so-called Umbrella Palm, which grows to a height of about 2 ft., bearing long, drooping leaves in a circle at the top of the slender stems.

Cypress, the name applied to various coniferous, evergreen and deciduous trees of Europe, Asia, and North America. The cypresses are tall shapely trees, with light, graceful leaf sprays and yellow-brown wood, usually soft. They are popular for ornamental planting, the wood of many of the species is valuable as timber, because of its durability, its ability to withstand dampness, and the ease with which it can be worked. Of the genus *Cupressus*, one of the best known species is *C. macrocarpa*, the Monterey Cypress, native to California and grown also in Australia and Europe. When sheltered, this tree is a magnificent evergreen of symmetrical growth, but when exposed to the winds it becomes picturesquely misshapen, its contorted branches forming a broad ragged crown. *C. sempervirens* has been planted as a symbol of mourning in the burial places of Europe from time immemorial, and of its wood the cross of Christ is said to have been fashioned. Of the genus *Chamaecyparis*, which is distributed in North America, Japan and Formosa, the most important species are *C. thyoides*, known as the White Cedar, which grows in swampy places on the Atlantic seaboard (see CEDAR); an Alaskan species, *C. nothkantensis*; and *C. lawsoniana*, a valuable ornamental tree, 200 ft. in height, seen on the Pacific coast. The most important species commercially is the Bald Cypress of the genus *Taxodium* (*T. distichum*), a tall deciduous tree growing abundantly in the Southern United States.

Cypress Vine (*Ipomœa quamoclit*), a genus of half-hardy climbing annuals belonging to the order Convolvulaceæ. There are three varieties, with scarlet, white, and rose-colored blossoms, all native to the East Indies, but common in tropical America.

Cyprian, or **Thascius Cæcilius Cyprianus** (c. 200-258), one of the fathers of the church, was born in North Africa. At the outbreak of the Decian persecution (250), Cyprian was persuaded to go into temporary concealment. In 257 persecution again broke out under Valerian, and Cyprian was banished; he was recalled and suffered a martyrdom under the severer edict of 258. To the development of the idea of the church's unity, he gave a strong impetus, finding the unifying bond not in the acceptance of a common standard of truth—the Apostolic Confession, the prevalent theory of the time—but in the fact that the bishops were the successors of the apostles by unbroken historic descent—the hypothesis of apostolic succession. He was the first to promulgate several ecclesiastical doctrines which became distinctive features in the constitution of the Roman Catholic Church. Consult editions of his collected works by J. Fell and Pearson and an English translation in the *Ante-Nicene Fathers*, vol. v.; also E. W. Benson's *St. Cyprian: His Life, His Times, and His Works*.

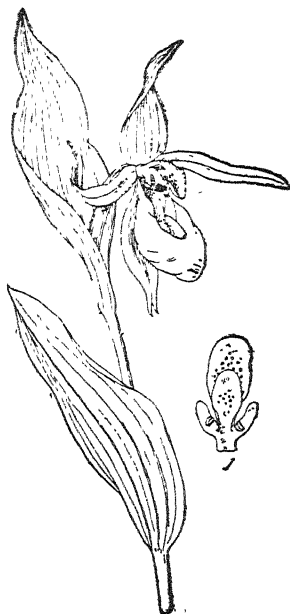
Cyprinidæ ('carp-like'), a family of freshwater bony fishes to which belong the carp, the goldfish, the chub, and other less familiar fishes.

Cyprinodontidæ ('carp-toothed'), a family of bony fishes, including small forms widely distributed over the world in fresh waters. The males and females differ from one another in size and appearance, the former being among the smallest known fish.

Cypripedium, a genus of beautiful hardy terrestrial orchids of the family Orchidaceæ, popularly known as **LADY'S SLIPPER** or **MOCASIN FLOWER**. They are widely distributed throughout the north temperate zone. The popular name comes from the fact that the labellum in all species forms a sort of cup or pouch, resembling a slipper. There are about 30 species. See also **LADY'S SLIPPER**.

Cyprus, an island in the Mediterranean Sea, under British administration. It lies 40 m. south from the coast of Asia Minor and about 60 m. to the west of Syria. Its greatest length is 140 m., its greatest breadth 60 m., and its area 3,584 sq. m. Two parallel mountain ranges traverse the island from east to west, with a wide alluvial plain between. In this plain lies a large proportion of the island's cultivated area. The climate is dry and healthful except for hot summers on the coasts. Copper is mined on a large scale, and there are deposits, also, of asbestos, gypsum,

terra umbra, and sandstone. Agriculture is the leading industry and about one-third of the cultivable land is utilized. The principal products are wheat, barley, oats, olives, cotton, grapes, raisins, potatoes, silk, wine, tobacco, and carobs (locust beans). The small horses or ponies of Cyprus are strong and hardy, and Cyprian mules are exported in



Cypripedium Calceolus.

1, Gynoecium.

large numbers for army purposes. There are nearly 500 m. of motor roads on the island, some 2,000 m. of village roads, and a narrow-gauge railroad from Famagusta to Evrykhon, about 75 m. The population of Cyprus is 310,709, of which 61,442 are Mohammedans. The capital is Nicosia. There are more than 700 elementary schools on the island, as well as Turkish and Christian secondary schools. Cyprus is administered by a High Commissioner, assisted by an executive council. The legislature consists of 18 members; three are elected by Mohammedan voters, and nine by non-Mohammedans.

Cyprus was fully colonized by Greeks and Phœnicians (100-500 B.C.), and successively annexed by Assyria (700-670), Egypt (569), and Persia (525). For two centuries it remained in dispute between Persia and the Greeks, but fell to Ptolemaic Egypt in 306,

and to Rome in 57 B.C. Christianity was introduced by St. Paul. The long prosperity of the island was wrecked by Saracen raids (644-975), and later by Byzantine misrule, till in 1191 it was occupied by Richard Cœur de Lion, and sold first to the Knights Templar, and then to Guy de Lusignan, king of Jerusalem, whose dynasty gave place to Venetian rule in 1489. In 1570-1, the Turkish sultan Selim II. expelled the Venetians, and for three centuries Cyprus was under Turkish rule. In 1878, under a treaty which recognized the sovereignty of the Sultan, the island passed under British administration. The Convention of 1878 remained in force until November, 1914, when, by the entrance of Turkey into the war against the Allies, it was automatically annulled and Cyprus was annexed to the British crown. During the war more than 10,000 Cyprians volunteered as muleteers with the army in Salonika. Antiquities of all periods are numerous and important—tombs everywhere of prehistoric, Greek, and Roman date, Byzantine castles, splendid Gothic churches, and perfect Venetian fortresses. Explorations of the caves (1902) have revealed fossil remains of elephants and other animals now extinct. Consult Lang's *Cyprus*; Luke and Jardene's *Handbook of Cyprus* (1920).

Cyrano de Bergerac. See **Bergerac**.

Cyrenaica, one of the two independent districts of Italian Libia, on the northern coast of Africa. Agriculture and cattle breeding are the chief industries, and barley and olives are the leading crops. Ostrich feathers form an important article of trade, and sponge fishing is carried on. The capital is Benghazi. The European population is 9,402, comprising about 7 per cent. of the whole. The name Cyrenaica is applied also to an ancient district in the north of Africa extending from the borders of Carthage on the west to the borders of Egypt on the east. It is a high plateau bordering on the Mediterranean, with a fertile soil and a delightful climate. Wheat, oil, corn, fruits, wine, and dates are produced. The region was once famous for a plant *Silphion*, which produced a gum known as *laser*. It saw fighting in World War II.

Cyrenaics, a school of ancient Greek philosophy, was founded by Aristippus of Cyrene, who was a pupil of Socrates, in the second half of the 4th century B.C. The central tenet of his teaching was that the chief pursuit of man is and ought to be a prudent personal enjoyment; hence all knowledge is relative, and restricted to personal feelings.

Cyrene, Greek colony on the n. coast of Africa, between Alexandria and Carthage, was founded in 631 B.C. by colonists from Sparta, led by Aristoteles or Battus. The city, which soon became rich and prosperous, lay 8 m. from the coast. Its chief trade was in the now extinct plant *silphion*, the properties of which seem to have been medicinal. Battus was succeeded by his son. Their dynasty lasted for eight generations. After the fall of the Battiad dynasty, about 460 B.C., Cyrene passed into the hands of the Ptolemies, and later became part of the Roman empire.

Cyril (827-69), and **Methodius** (830-85), sons of a Thessalonican named Leo, were the great apostles of the Slavs in the 9th century. Cyril, or Constantine, known as the Philosopher, successfully preached the gospel to the Khazars, and Methodius became abbot of a monastery in Constantinople. Subsequently when Boris, Bulgarian prince, requested a missionary to teach his people, the brothers were sent, preaching also in other Slavonic countries. They also set to work to give the Slavs an alphabet, named Cyrillic, and to translate the Scriptures. Though later Popes stigmatized them as Arians, they were ultimately canonized.

Cyrillic Alphabet, an alphabet presumably devised by Cyril and Methodius in the 9th century for the use of the Moravians and Bulgarians, and consisting of 38 letters based on the Greek uncials of the 8th and 9th centuries. Although the alphabet has been increased by 10 letters because of the greater number of Slavonic sounds as compared with the Greek, 24 of the characters still remain identical with the Greek uncials. With slight modifications the Cyrillic is the alphabet now in use in Bulgaria, Russia, and Servia. Consult Taylor's *The Alphabet*.

Cyril of Alexandria, St. (c. 376-444), one of the Fathers of the Church, patriarch of Alexandria in 412. He proved his somewhat intolerant zeal by closing the churches of the Novatians and expelling the Jews from the city (415). He was in a measure at least responsible, also, for the murder of Hypatia. The latter part of his life was spent in his controversy with Nestorius, against whom the synod held at Alexandria in 430 hurled 12 anathemas, and who was afterwards condemned by the council of Ephesus, 431 (see **NESTORIANS**).

Cyril of Jerusalem, St. (c. 315-86), one of the Church Fathers, bishop of Jerusalem, but twice deposed. He participated in the second ecumenical council at Constantinople.

His writings are valuable for their doctrine and description of early church ritual. They were translated into English by Gifford in *The Nicene and Post-Nicene Fathers*.

Cyrus the Great, or Cyrus the Elder (d 529 B.C.), founder of the Persian empire. Accounts of his birth and lineage vary. According to Herodotus, he was the son of Cambyses, a noble Persian, and Mandane, daughter of Astyages, king of Media. In course of time he rose against Astyages, whom he defeated in battle and dethroned. This story is contradicted by recently discovered monuments, including a cylinder in which, Cyrus describes himself as 'king of the city of Ansan (or Anshan),' and declares himself the son of Cambyses I, grandson of Cyrus I, and great-grandson of Teispes, conqueror of Elam, who was also the great-grandfather of Hystaspes, the father of Darius. Whatever his origin, Cyrus certainly attacked and defeated Astyages in a great battle in 549 B.C., seized his capital of Ecbatana, and dethroned him. In 547 he overthrew Cræsus and the Lydian empire, capturing Sardis, while his general, Harpagus, proceeded to subdue the Greek cities in Asia Minor. In 539 he took Babylon 'without fighting,' thus making himself master of all Asia from the Mediterranean to the Hindu Kush. He at once entered upon a policy of religious conciliation, and in the following year he gave permission to the Jewish captives to return home. Consult Horner's *Cyrus the Great*; Holm's *History of Greece*.

Cyrus, the Younger, second son of Darius Nothus, king of Persia, and Parysatis, was made satrap of the maritime parts of Asia Minor, and of Lydia, Phrygia, and Cappadocia, by his father in 408 B.C. In 404 his father died, and he formed the idea of dethroning his brother, Artaxerxes Mnemon. For this purpose he collected a force of 13,000 Greek mercenaries, whom he led, with a large Asiatic force, from Sardis in the spring of 401 B.C. His troops, the famous Ten Thousand of Xenophon, met the king's army at Cunaxa, near Babylon, and defeated it; but Cyrus was slain.

Cyst (*kystis*, 'a bladder'), a word sometimes applied, in the original sense, to hollow organs with thin walls, as the urinary bladder and gall-bladder; but commonly reserved for the designation of pathological structures or new formations within the body having the bladder form.

Cysticercus, a generic name formerly given to the 'cystic worms' (bladder worms),

often found within watery cysts in vertebrates, before it was realized that these are merely the first stage of tapeworms (*Cestoda*). See TAPEWORMS.

Cystidea, an extinct group of the Echinodermata which exhibit affinities to sea urchins (echinoids) and crinoids. As their name implies, they have a box-like, calcareous shell, which consists of many small, close-fitting plates.

Cystitis, in pathology, inflammation of the bladder. See BLADDER.

Cytisus, a genus of leguminous shrubs and small trees, of which the Common Broom, *C. scoparius*, is the best known species. Of the greenhouse varieties, *C. canariensis*, commonly known as the Genista, bears fragrant yellow flowers. See BROOM; LABURNUM.

Cytology, the science of the structure and functions of organic cells. See CELL.

Cyzicus, the ancient name of a peninsula of Asia Minor projecting into the Sea of Marmora. In early times Cyzicus was a Milesian colony, and the city of Cyzicus is described by Strabo as one of the first cities in Asia.

Czar. See Tsar.

Czarnecki, or Czarnecki, Stefan (1599-1665), Polish general. When Poland was invaded in 1654 by the Russians and Swedes, he was forced by Charles X. to yield Cracow, after a heroic defence of two months (1655) but in 1660 he inflicted a heavy defeat on the Russians at Polonka and at Lachowicz.

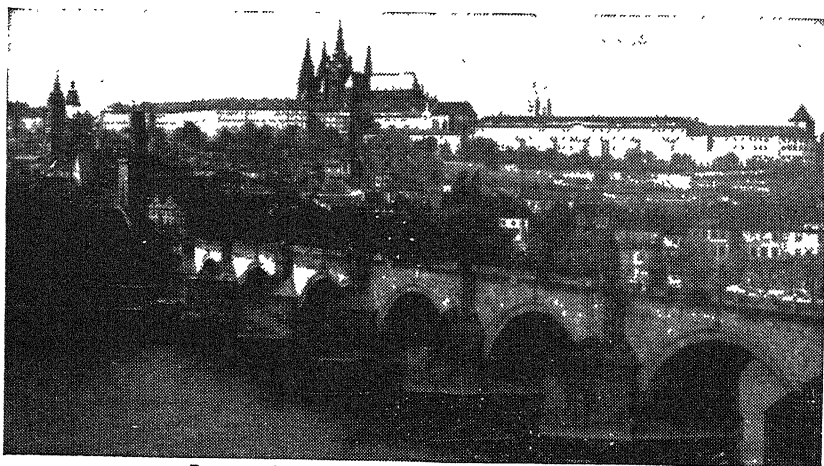
Czartoryski, Adam Georg, Prince (1770-1861), leader in the Polish insurrection of 1830, was born in Warsaw. He joined the rising of Kosciuszko against the Russians, following the second partition of Poland, and was captured and taken as a hostage to St. Petersburg, where he gained the royal favor. When the revolution of 1830 broke out, he warmly espoused the popular side. Appointed president of the national government, January, 1831, he devoted half his property to the public service. When Poland's hopes were destroyed by the terrible events of August, 1831 (see POLAND), he resigned his post. Exempted from the amnesty offered by Russia, he fled to Paris. He liberated his serfs in 1848, and declined the amnesty later offered him by Alexander II. (1858).

Czaykowski, Czajkowski, or Czaikowski, Michail, afterward Sadyk Pasha (1808-86), Polish author and soldier, fought in the Polish revolution of 1831, against Rus-

sia, and afterward fled to Paris, where he wrote many striking novels dealing with the life of the Cossacks and the Slavs along the Danube. In 1840 he was sent on a secret mission to Constantinople, and there went over to Mohammedanism, taking the name of Sadyk. His novels include *Wernyhora* (1838), *The Moslem and the Christian*, and *The Black Pilgrim*, the last two translated into English.

Czechoslovakia, a former republic of Central Europe which came into existence in 1918, and ceased to exist as such in 1939. It comprised the Czechs who occupy

for the most part Roman Catholics, though there are small numbers of Protestants and Jews. Illiteracy is almost unknown. The constitution, of Feb. 29, 1920, proclaimed Czechoslovakia to be a democratic republic. The National Parliament consisted of a Chamber of Deputies of 300 members elected for six years and a Senate of 150 elected for eight years; the two chambers jointly elected the President, for seven years. Prague was the capital; p. 848,081. The Czechs established themselves in their present home toward the end of the 6th century, and at the same time the Slovaks settled in Northern Hungary. The



Prague, Czechoslovakia, The Hradzany Palace.

Bohemia, Moravia, and Southern Silesia, formerly under Austrian domination, and the Slovaks of Slovakia, in Northern Hungary. Its area was 54,207 sq. m.; p. 14,726,158. This territory lies between Germany and Poland on the north and Austria and Hungary on the south, with the ranges of the Bohemian Forest, the Erzgebirge, and the Riesenberge on the west and northwest, and the Carpathians on the northeast. It is watered by the Elbe and its tributary, the Moldau, and by other affluents of the Danube. The Czech country especially is rich in mineral resources—coal, lignite, graphite, and iron—and in the fertility of its soil, more than half of the area of Bohemia and Moravia being under cultivation. Transportation facilities are excellent, and industrially and commercially the district is highly developed. The Czechs and Slovaks are of the same race (Slavic) and except for differences in dialect speak the same tongue. They are

Slovaks soon came under the Magyar yoke and for a thousand years had no independent history, while the Czechs formed the once powerful kingdom of Bohemia. In 1526 under threat of Turkish invasion they united in a defensive union with Austria and Hungary, electing Archduke Ferdinand of Hapsburg to the throne. From the beginning the Hapsburg rulers adopted a policy of Austrianization and Germanization, but the national spirit of the people remained strong, and in 1618, tired of foreign interference, they revolted, deposed Ferdinand II, the Hapsburg ruler, and made the Protestant Elector Palatine, Frederick, their king. They were defeated, however, at White Hill in 1620 (see THIRTY YEARS' WAR), the elector was overthrown, and the whole country was ravaged and deprived of its independence. In 1867 a further step in oppression was taken when Austria and Hungary reached an agreement whereby Bohemia, Moravia, and

Silesia became subject to Austria, and Slovakia to Hungary.

When the World War (see EUROPE, GREAT WAR OF) broke out in 1914 large numbers of Czechoslovaks refused to aid the Central Powers. A movement for independence was organized abroad by the Czech leader, Thomas G. Masaryk, with the coöperation of Czechoslovak emigrants, and on Nov. 14, 1915, a declaration was issued in Geneva, Paris, and London breaking off all ties with Austria. A Czechoslovak National Council, or Provisional Government, with Dr. Thomas Masaryk as chairman, was formed in 1916 which represented the new nation before the Allies in all diplomatic and military affairs. On Dec. 10, 1917, the organization of the Czechoslovak army was formally authorized by Premier Clemenceau; Italy acknowledged the new state on April 23, 1918, France on June 30, Great Britain on Aug. 13, the United States on Sept. 3, and Japan on Sept. 9. On Oct. 18, the Provisional Government issued a declaration of independence from headquarters in Paris, and on Oct. 28 the Czechs in Bohemia seized Prague. Dr. Masaryk became President of the new republic, Nov. 14, 1918. The Czechoslovaks rendered valuable aid to Russia in the campaign of 1914, distinguished themselves also in the military operations in the Somme region in 1918, and on the Italian front. Their army in Russia occupied Siberia and a part of European Russia and defended this territory as a part of the Allied forces.

In 1935 Dr. Masaryk resigned the presidency and was succeeded by Dr. Eduard Benes. The returning strength of Hitler's Germany was a growing menace. The predominating German population of Czechoslovakia's Sudeten borderland, incited by Hitler, clamored for cession to Germany. German demands were followed by the Munich Conference, 1938. Czechoslovakia then ceded some 11,100 sq. m. to Germany, 4,600 sq. m. to Hungary, and 400 sq. m. to Poland, reducing her population by about 4,900,000; forced changes were made in her government and Dr. Benes resigned,—a sacrifice for the peace of Europe. Deserted by allies, Czechoslovakia was unable to resist in 1939 when Germany and Hungary seized her. However, her government-in-exile in Eng. won recognition from the United Nations in 1941. Dec. 12, 1943, Russia and Czechoslovakia signed a 20-year mutual aid agreement.

Czechs, Cheks, or Chekhs, a Slavic people, settled in the extreme northwest of the

old Austro-Hungarian Empire. The Czech tongue, including its dialects Moravian and Slovak, is one of the west branches of the great Slavonic family of languages, of which Russian is the chief. Its literature dates from the 9th century, when the Czechs embraced Christianity. The name Czech (etymology obscure) is first used by the Russian historian Nestor (1056-1116). See CZECHOSLOVAKIA; SLAVS.

Czenstochowa (Czestochowa), town, county of Kielce, Poland, is situated on the Warta, near the frontier of Silesia. It contains a convent with St. Luke's alleged picture of the Virgin—the famous 'Black Virgin'—visited yearly by thousands of pilgrims. In 1655 Czenstochowa was the only place in Poland which offered resistance to Charles Augustus of Sweden; p. 117,692.

Czermak, Jaroslav (1831-78), Bohemian painter, brother of Johann Czermak.

Czermak, Johann Nepomuk (1828-73), Bohemian physiologist. He did important work in the use of the laryngoscope and wrote *On the Laryngoscope* (1860; Eng. ed., 1861).

Czernovitz (Rum Cernautzi), city, Rumania, capital of Bukovina. It is the see of an archbishop of the Orthodox Greek Church, and has a University, founded in 1875. Its most prominent public buildings are the archiepiscopal residence, the Greek Cathedral (1864), on the model of St. Isaac's of Petrograd; and the Jewish synagogue (1877), in Moorish style. Czernovitz is the seat of an active trade; p. 111,122. Czernovitz was the scene of some of the most violent conflicts of the World War.

Czerny George, or Kara George (1766-1817), Serbian patriot, grandfather of King Peter of Serbia, was born of peasant parentage. Of gigantic stature and herculean strength, dauntless courage, and resourcefulness, he was a born leader, and after collecting a band of followers, with secret help from Russia, he not only repeatedly defeated the Turks, but wrested Belgrade from them, and ruled it from 1806 to 1813, striking such terror into his foes that they called him *Karajorj* ('Black George'), a term which was afterward adopted as the designation of the present Yugoslavia dynasty. But when Russia and France went to war, the former could no longer assist Czerny, and he was defeated and compelled to take refuge in Vienna. Milosh Obrenovich succeeded him, and when Czerny returned to his native country, he was assassinated.

D, the fourth letter in the English alphabet, as well as in the Phœnician, Hebrew, Greek, and Latin, from which last it was immediately derived. It originally represented the sound which it generally has in English—*viz.* a voiced *t* or voiced point stop. In modern English the most frequent change in the pronunciation of *d* is that it becomes voiceless—*i.e.*, *t*—when it follows a voiceless consonant ('dropped,' 'backed').

D, the Roman numeral for 500, represented one-half of the original Tuscan numeral CLO. A dash over the *D*, as \overline{D} , denotes that its value is increased tenfold.

D, in music, is the second note in the natural scale of *C*. The major key of *D* has two sharps; the minor key, relative to the major key of *F*, has one flat.

Dab, a species of flounder, common on European coasts. It is distinguishable from plaice and flounder by its light-brown, or ashen-gray color, with small irregular dark spots, by the roughness of its small, close-set scales, and by its more arched lateral line. The Rusty Dab (*L. ferruginea*) and Rough Dab (*Hippoglossoides platessoides*) are found in the American North Atlantic, and the Alaska Dab (*L. aspera*) in the North Pacific.

Dabchick, any of the smaller grebes, especially in the United States *Podilymbus podiceps*. They are exceedingly quick divers. See GREBE.

Dabney, Charles William (1855-), American educator. He was president of the University of Tennessee (1887-1904); and Assistant U. S. Secretary of Agriculture (1892-7). From 1904-20 he was president of the University of Cincinnati. He is the author of books on historic, scientific and educational subjects.

Da Capo (abbrev. *D.C.*), in music, a direction to return to the beginning of the movement, and repeat to the word *Fine* or the sign :S:.

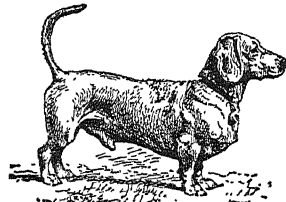
Dacca, city in Bengal, British India, on the Buri-Ganga, connecting the Ganges and the Brahmaputra. It was the capital of the short-lived Province of Eastern Bengal and Assam (1905-12). From about 1610 until

1704 it was the seat of the Mohammedan government of Bengal. The suburbs extended 15 m. northward, where mosques and brick buildings are still found buried in thick jungle. The manufacture of muslins, celebrated in the 18th century, is almost extinct, but shell carving, carried on from ancient times, is still an important industry; p. 138, 518.

The *Division of Dacca* consists of four districts: Dacca, Mymensingh, Faridpur, and Akarganj. Its area is 14,822 sq. m. and its population, 13,864,104. The *District of Dacca* has an area of 2,723 sq. m.; p. 3,432,577.

Dace, Dare, or Dart (*Leuciscus vulgaris*), a fresh-water fish in the carp family Cyprinidæ. The various species include the Horned Dace, Long-nosed Dace, and the Red Dace (*Notropis megalops*), or common Shiner.

Dachshund, a breed of dogs long common in Germany and introduced into Great Britain towards the middle of the 19th century.



Dachshund.

In shape and appearance the dachshund is allied to the basset hound, having very short legs, an abnormally long body, and a head resembling that of a miniature bloodhound; in color it is black and tan or brown. It is a good water dog, affectionate, and courageous.

Dacia, an ancient region n. of the Danube, including the modern Transylvania, Wallachia, Moldavia, Bessarabia, and part of Hungary. Its inhabitants were akin to the Gætæ or Goths. Trajan made Dacia a Roman province.

Dacites, are volcanic rocks which occur principally as lava flows, and are very closely related to the andesites.

Dacoits, or Dakaits, a name used for

brigands herding in gangs in various parts of India, and living by *dakaiti* or robbery with violence.

Da Costa, Isaac (1798-1860), Dutch poet. His fame rests upon the politico-historical poems, *Vijfentwintig Jaren* (1840), *Hagar* (1847), and *De Slag bij Nieuwpoort* (1859).

Dactyl, in Greek and Latin versification, a measure consisting of one long and two short syllables. It is the basis of the hexameter measure.

Daddy-long-legs, a popular name for the very long-legged, globular-bodied 'harvestmen' of the family Phalangidae, which are closely related to the spiders. Numerous species inhabit North and South America and other warm regions.

Dado, in architecture, the solid cubic block which forms part of the pedestal of a column between the base and cornice. The term is also applied to the space running around the walls of a room to a height of three or four feet from the floor, decorated in paper or distemper different from the remainder of the walls.

Dædalus, in Greek mythology, an Athenian of the royal house. He went to Crete, where he made the famous wooden cow for Pasiphaë; and, after the birth of the Minotaur, constructed the labyrinth in which the monster was confined. This brought him into disfavor with Minos and consequently Dædalus made wings for himself and his son Icarus, with which he flew to Italy, though Icarus flew too near the sun and the wax which held the wings melted causing him to fall into the sea. Dædalus is said to have invented the axe, the saw, the auger, the gimlet, and glue; and in sculpture to have been the first to give an appearance of lifelike action to statues.

Daendels, Herman Willem (1762-1818), Dutch general, entered the service of the king of Holland (1806), and was governor-general of the Dutch East Indies, until the capture of Java by the British in 1811. He accompanied Napoleon into Russia (1812-13), and in 1815 was entrusted with the organization of the Dutch West African colonies.

Daet, pueblo, Luzon, Philippine Islands, on the Daet River; p. 14,413.

Daffodil, the popular name for *Narcissus pseudonarcissus*, a member of the order Amarillidaceæ. See NARCISSES.

Dafoe, Allan Roy (1883-1943), Canadian physician; became prominent as attendant doctor at birth of the Dionne quintuplets at Callander, Ont., May, 1934, and by their

survival and growth under his professional care

Dagami, pueblo, Leyte, Philippine Islands, on the Binahaan River; 15 m. s.w. of Tacloban; p. 17,803.

Dagestan, or **Daghestan**, former Russian province in the Caucasus, now an autonomous Soviet republic. It extends along the Caspian, and stretches inland to the crest of the Caucasus range; area, 13,600 sq. m. Cattle-grazing is the most widespread occupation, and there are also domestic manufactures and some trade; sulphur and salt are worked. Since 1921 it has constituted a part of the Russian Socialist Federal Soviet Republic but is governed by its own Central Executive Committee and Council of People's Commissaries; p. 798,181.

Dagger, a short, acutely pointed weapon usually having a flat triangular blade and cylindrical grip. The earliest forms were of flint (abundant in Scandinavia), bone or horn. Copper, iron, and bronze daggers, often richly decorated with gold and silver, and some few specimens of solid gold and silver have been known since early Persian and Egyptian times.

Dagnan-Bouveret, Pascal Adolphe Jean (1852-1929), French painter. His reputation was established by his reproductions of Breton life and character, of which *A Wedding-party at the Photographer's*, the amusing *Vaccination*, and *Le pain benit* (Luxembourg, 1885) are typical examples. His *Breton Pardon* (1887) was the event of the Salon, and his other striking picture of that year, a Virgin in sunlight and shadow, gave the first indication of the mystic and religious tendencies later further developed in his *Last Supper* (1896), and *The Supper at Emmaus* (1898). Several examples of his paintings are in the United States, one of his figures of a Breton peasant being in Chicago, while *A Pardon in Brittany* is in New York, and his peasant picture, *The Village Musician* (1880), is in the Walters Collection, in Baltimore.

Dago, a sailor's term for any one of Spanish, Portuguese, or Italian descent; said to be a corruption of the common Spanish name Diego (Jack or James). The term is colloquially employed in the United States to designate Italian laborers.

Dagō, Dagden, or **Gioma**, island belonging to Esthonia, in the Baltic Sea, near the entrance of the Gulf of Finland; area, 367 sq. m. Its shores are rocky and rugged, and the soil is sandy and marshy, and well forested. The population, about 17,000, three-fourths

of whom are Esthonians, are chiefly engaged in fishing and cattle-rearing.

Dagoba. See **Tope**.

Dagobert I., Merovingian king of the Franks, who ruled from 628 to 638. His reign is the most brilliant period of the 5th and 6th centuries. He surrounded himself with high ecclesiastics and greatly enriched the churches and founded the Abbey of St. Denis.

Dagon, a deity worshipped by the Philistines. He had temples at Gaza and Ashdod.

Daguerre, Louis Jacques Mandé (1789-1851), the inventor of the diorama and the pioneer of the process of photography named after him (daguerreotypy), was born in Cormeilles, Normandy. For many years he experimented unsuccessfully to fix the pictures in the camera obscura, and finally coöperating with Niepce (1827), who for 15 years had been laboring to attain the same object, and had made some important discoveries, the two worked together at their 'sun-pictures' up to the time of Niepce's death (1833). In 1839 the discovery was announced to the world.

Daguerreotype. See **Photography**.

Dagupan, town, the northern terminus of the railroad from Manila, has road communications with all the surrounding provinces, and is an important trade center; p. 22,441.

Dahabiyeh, a decked passenger boat used on the Nile. It has a sharp prow, a broad stern, and one or two masts with lateen sails.

Dahl, däl, Johann Christian Claussen (1788-1857), Norwegian painter, was born in Bergen. He settled in Dresden (1818), becoming professor in the academy there. His paintings are chiefly landscapes.

Dahl, Vladimir Ivanovitch (1801-72), Russian author and lexicographer. From 1841 to 1858 he was in the office of the Minister of the Interior. Settling in Moscow he wrote, under the pseudonym of Kasak Lugansky, a number of tales of Russian life. He is chiefly remembered for his excellent Russian Dictionary (4 vols., 1861-8), and his work on Russian songs and folklore.

Dahlak, archipelago in the Red Sea. Since the time of the Romans it has been famous for its pearl fisheries; p. 1,500.

Dahlgren, John Adolf (1809-70), American naval officer, the son of a Swedish father and an American mother. He entered the U. S. navy and in 1847 was assigned to the ordnance department, becoming an authority on all matters concerning naval armaments. He invented a light howitzer which was adopted by the Navy Department in 1850, and in the

same year invented the powerful shell gun which bears his name and the introduction of which was an event of great importance in the history of the development of large ordnance. Dahlgren was also instrumental in securing the adoption of powerful 11-inch guns for the navy. He took a notable part in the Civil War, especially in the taking of Charleston, S. C. After the war he commanded the South Pacific Squadron (1865-7), and was again chief of the ordnance bureau (1868-70).

Dahlgren, Karl Frederik (1791-1844), Swedish humorous author. His first great work *Molbergs Episiter* (1819-20) showed an odd blending of the idyllic and burlesque.

Dahlia, a genus of herbaceous composite plants which derives its name from the Swedish botanist Dahl (1791). They are cultivated extensively for their profuse and richly colored bloom, which makes them extremely decorative. There are as many as 2,500 varieties, practically all of which have come from one greatly variable species known as *D. variabilis* or *D. rosea*. The cactus variety, however, has been developed from *D. juarezii*. Dahlias are known as show, fancy, pompon, single and cactus. They vary from the single type, not unlike a daisy with broad rays, to the tiny, tightly-quilled, formal pompon, and to the cactus-flowered, resembling a chrysanthemum; and their colors are equally varied. Yellow, lilac, white and the deepest maroon, are found in innumerable combinations, in fact the only colors lacking are the shades of blue. Dahlias are propagated by cuttings, by division of roots, by grafting to produce rare varieties, and by seeds to produce new kinds.

Dahlstierna, Guno Eurlsius (1661-1709), Swedish cartographer and poet, born in Ohr. Among his works are: *Elegy on the Death of Charles XI.* and *The Goth's Battle Song*.

Dahn, Julius Sophus Felix (1834-1912), German jurist and author, was born at Hamburg.

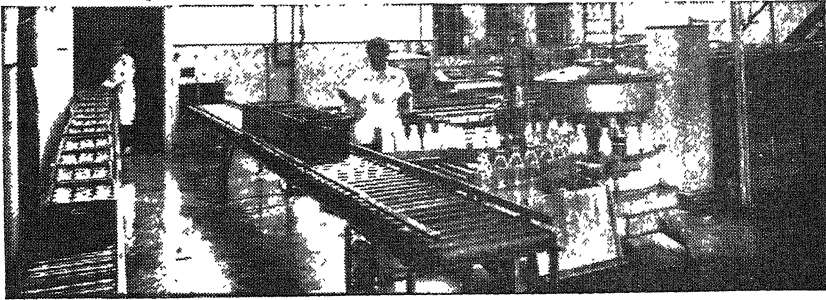
Dahomey, a colony of French West Africa, reaching from the Gulf of Guinea northward to the indefinite limits of the ancient kingdom of Dahomey, with Nigeria on the e. and Togoland on the w. The coast line measures 75 m.; the total area of the colony is about 40,000 sq. m. The climate is moist and hot, particularly along the low sandy coast, where the average temperature is 80° F. The soil is a rich red clay and very fertile. Groves of oil-palms encircle each town, and palm-oil is made in large quantities. Maize, beans, and peas, as well as cassava, yams, sweet potatoes,

limes, pineapples, and other tropical fruits, grow luxuriantly; cotton, sugar, and spices are also grown. The chief port is Kotonu.

The population is nearly 1,000,000, chiefly negroes who call themselves Fon or Fawin. The chief town and seat of government is Porto Novo with a population of about 27,000. The colony represents the former native kingdom of Dahomey, which for nearly two hundred years was a chief seat of the grossest fetish idolatry, involving yearly a great number of human sacrifices. These abominations were put an end to after the country was subdued by the French in 1892. Consult Francois' *Notre Colonie du Dahomey*.

Church of St. Mary the Virgin, New York City.

Dairying is that branch of agriculture which has to do with the production of milk, butter, cheese, and other milk products. Dairy farming was formerly confined to limited areas, with certain types of soil and climate, but more recently it has been found to be profitable under such varying natural conditions that it is successfully carried on to some extent in practically every State and territory of the United States. At one time believed to be dependent on good pastures, it is now conducted on a considerable scale in sections of the East without pasturage, under what is



A Modern Dairy: Interior.

Daimiel, city, province of Ciudad Real, Spain; famous for its grapes and vegetables; p. 16, 188.

Daimio, or **Daimyo**, the title of the feudal lords of Japan who rendered homage to their chief, the Mikado. With the abolition of feudalism in 1871, they surrendered their lands and privileges to the Mikado, who granted them pensions.

Daimler, Gottlieb (1834-99), inventor, was born at Schorndorf, in Wurtemberg. In 1872 he joined Dr. Otto, near Cologne, and aided him in the production of the Otto gas engine. He retired in 1882 to devote himself to the construction of light, high-speed gas and oil engines, and later, in 1887, to the invention and development of the motor-propelled carriage which bears his name. See OIL AND GASOLINE ENGINES; also MOTOR CARS; MOTORCYCLES.

Daingerfield, Elliott (1859-1932), American artist, was born in Harper's Ferry, Virginia. Among his best known works are *The Waters of Oblivion*; *The City That Never Was*; and *The Epiphany* and *The Magnificat*, mural paintings for the Lady Chapel of the

known as the soiling system, the cows being kept up the year around upon green crops cut and brought to them. Where pastures are available, however, and the land is not too expensive, the pasturage system is still followed, supplemented by the feeding of grain.

The cows mostly kept upon dairy farms are the Dutch or North Holland, commonly called Holstein, or Holstein-Friesian, Short-horns, Ayrshire, the half or higher bred grades of these, and the common 'native' cows, the descendants of the promiscuous mixture of the various races of cattle brought into America. For the butter dairy the Jersey breed and its grades are the most profitable, and American pastures are now quite thickly sprinkled with the Jersey colors. Ayrshires come next, and the Devon follows in favor; but of necessity the common native and much cheaper cow forms the rank and file of the dairy herds.

The development of the dairying industry has been rapidly advanced by the invention of various kinds of dairy machinery, such as: milking machines, bottle washers, bottle fillers, cream separators, butter churns, cheese-

making utensils, etc. Great advances in pasteurization, refrigeration and transportation methods, have improved the quality of dairy products. The results may be seen in the increased mechanization of dairying upon the farm as well as in the multiplication of central creameries and factories. With the growth of the dairying industry, there has been an increasing tendency toward specialization. The production of milk for wholesale and retail trade, the production of cream for creameries and for ice-cream factories, butter making, cheese making, the preparation of condensed milk, and the manufacture of ice-cream, each constitutes an important industry in itself.

Before the 20th century there was little attempt to grade milk and cream on a basis of sanitary or market value, but there has since been a general movement in that direction and Federal and State governments have established regulatory provisions, defining grades based on the sanitary quality of the product. Thus we have *sanitary milk*, any clean milk carefully produced; *guaranteed milk*, usually meeting a certain standard of fat, and bacterial content; *certified milk* which has been produced under certain prescribed conditions; *inspected milk*, produced by cows which have passed inspection; *pasteurized milk*, which has been heated to a high temperature to kill all germs and immediately cooled; and *modified milk*, a high-grade milk altered in composition for special uses.

Butter-making is carried on both on the farm and in creameries, where butter is manufactured on a large scale from milk supplied from many herds. In some places the milk is taken to the creamery for separation, and such a creamery is known as a whole-milk creamery; in other places the farmer has his own separator and delivers only the cream to the creamery. He is commonly paid by the amount of fat delivered, which is determined by the Babcock test. See BUTTER.

Cheese-making is carried on chiefly in cheese factories, nearly 97 per cent. of the cheese manufactured in the United States being made away from the farm. Wisconsin and New York are the largest cheese manufacturing States, producing over 79 per cent. of all the cheese in the United States. American dairy cheese is made under the well-known Cheddar system, so called, which is prevalent in parts of England, and in Ayrshire and other localities in Scotland. This is the American cheese which is so well known

and highly regarded in Great Britain, when purely made under the best system of management. But a considerable variety of cheese is now made in imitation of foreign kinds. See CHEESE.

The process of condensing milk consists in removing a portion of the water from the milk by heating it in a partial vacuum. The milk used must be perfectly fresh and clean and it is condensed until $2\frac{1}{2}$ parts of fresh milk make one part of condensed. There are two classes, sweetened and unsweetened. The sweetened class is preserved chiefly by the addition of a large amount of sugar; the unsweetened by heating in a can under pressure until it is completely sterilized.

Another form of preserved milk is powdered milk, prepared by removing part of the fat and drying the milk to a fine white powder which keeps well and dissolves when water is added. Different grades of dried milk are made, ranging from skim-milk to whole milk. Food manufacturers are the largest consumers. Buttermilk and skim-milk are valuable as food for calves, pigs, and poultry, and skim-milk has also a high fertilizer value.

Americans are the world's greatest consumers of ice-cream, so that selling cream to ice-cream factories offers a wide and profitable field to the dairy farmer, who up to the present time has not himself engaged in the business of ice-cream making. Wisconsin, New York, Iowa, Minnesota, Ohio, and Illinois are the leading dairy States. Wisconsin, Minnesota, and Iowa are the leading butter States; Wisconsin produces the largest quantity of cheese, and New York is the leader in the production of condensed milk, with Illinois second.

Dairy products are one of Canada's most valuable resources, Canadian cheese in particular having a high reputation. Denmark, also, has long been famous for its dairy industry and the quality of its products. Although only about one-third the size of New York State, it has over a million milch cows, or 43.4 cows to every 100 persons. A striking feature is the large number of small farms and small dairy herds. The butter is made mostly in coöperative creameries, and very little on small farms, which is thought to account for its high quality. See COOPERATION. See BUTTER; CHEESE; CATTLE; MILK.

Consult Gardner's *Live Stock and Dairy Farming* (1918); Hatch and Benkendorf's *Profitable Dairying* (1918); W. W. Yapp and

W. B. Nevens' *Dairy Cattle*, (1930), U. S. Department of Agriculture, *Bulletin*.

Dais, a lofty seat for one or more persons, covered by a canopy, whence it derives its name.

Daisy, a plant of the genus *Bellis*, of the family Compositæ.

Dakahlieh, or **Daqahlia**, province of Lower Egypt. Area 1,006 sq. m. The capital is Mansura; p. 986.643.

Dakar, fortified seaport town with a good harbor, capital of French West Africa, is situated in the colony of Senegal, near the extremity of Cape Verde; p. 40.200.

Dakota Formation, the lowest member of the Upper Cretaceous series in the western part of North America, especially in the Great Plains region.

Dakota Indians. See **Sioux**.

Dakota River, known also as **James River**, rises in the center of North Dakota, flows s. through South Dakota, and after a course of nearly 600 m. falls into the Missouri, 10 m. below Yankton.

Dakota Wesleyan University, a Methodist institution of learning for both sexes at Mitchell, South Dakota, established in 1883. It has collegiate, preparatory, normal, art, music, and commercial departments.

Dal, river of Sweden, rises on the Norwegian border, flows s.e. through Lake Siljan, and falls into the Gulf of Bothnia after a course of 280 miles.

Daladier, Edouard (1884-), French statesman, son of a Carpentras baker, he taught school, then served with distinction in World War, becoming infantry captain. Elected to Parliament 1919, as a Radical Socialist, he was several times Cabinet Minister and twice Premier prior to April 1938 when he again became Premier. He joined Prime Minister Chamberlain of Great Britain in signing the ill-fated Munich agreement, Sept. 29, 1938. He led France at the start of the European war in 1939, but resigned from office March 21, 1940. After the establishment of the Vichy government he and other high officials were placed under arrest. They were put on trial March, 1942 at Riom, but their trials were suspended April 2.

Dalaguete, pueblo, Cebu, Philippines, on the east coast; p. 23,000.

Dalai-Kui, islet in the middle of Lake Kosso in Mongolia. It is held in especial reverence by Mongolian Buddhists as the 'navel of the earth.'

Dalai-nor, ('Holy Sea'), the name of two lakes in Eastern Mongolia. One, called

also Kulun-nor, is situated in the n.e. extremity of Mongolia, about lat. 49° N. and long. 117° 30' E. It is entered by the Kerulen at the s.w. end, and the Argun leaves it at the n.e. The other lake lies in the s.e. extremity of Mongolia, nearly 200 m. n. of Peking. The name Dalai-nor is also applied by the Mongols to Lake Baikal.

Dalarne, 'The Dales,' also called Dalecarlia, an ancient division of Sweden, coinciding roughly with the present country Kopparberg. This district is inhabited by a fine race of peasantry who have several times played a decisive part in Swedish history. In 1434, under Engelbrecht Engelbrechtsson, they rose in revolt against the Danish conqueror; in 1520-3, roused to fury by the 'blood bath of Stockholm,' they helped Gustavus Vasa to drive the hated Danes out of the country.

Dale, David, 1739-1806, Scottish philanthropist, was born in Stewarton, Ayrshire; founded the village of New Lanark, engaged in cotton manufacture there, and established the first Turkey-red dye works in Scotland. Having seceded from the Established Church of Scotland, he founded the 'Old Independents,' of which he was chief pastor.

Dale, Richard, 1756-1826, American naval officer, was born near Norfolk, Va. On the outbreak of the Revolutionary War he entered the Virginia service, was captured by the British, and served for a short time in the British Navy, but subsequently returned to an American vessel and, after another period of captivity, was first lieutenant under John Paul Jones in the battle between the *Bon Homme Richard* and the *Serapis*.

Dale, Sir Thomas, d. 1619, colonial governor of Virginia. His administration was remarkable for its pitiless severity; he placed the colonists under martial law and republished regulations known as 'Dale's Laws'; famed for their severity.

Dalecarlia. See **Dalarne**.

D'Alembert, Jean Rond, 1717-83, French philosopher and mathematician, distinguished himself by several original observations, which may be found in his *Traité de Dynamique*, in which he enunciates his 'principle' of the equilibrium of dynamical forces.

Dalen, Nils Gustaf (1869-1937), Swedish scientist, was born in Stenstorp. The sun valve on unmanned lighthouses is one of his most important inventions. In 1912 he was awarded the Nobel prize in physics.

Dalgarno, George (c. 1626-87), Scottish writer for the deaf and dumb, was born in

Aberdeen. He is known especially for his *Ars Signorum* in which he sought to prove that ideas could be expressed by specific universal characters. He was the first to exhibit a finger alphabet for the dumb.

Dalhousie, James Andrew Broun-Ramsay, Marquis of (1812-69), governor-general of India, was born in Dalhousie Castle, Midlothian, Scotland. Consult Warner's *Life of the Marquis of Dalhousie* and the Duke of Argyll's *India under Dalhousie and Canning*.

Dalhousie University, a non-sectarian university, situated in Halifax, N. S., founded in 1818 by the ninth Earl of Dalhousie. Its school of medicine has been greatly strengthened by gifts from the Rockefeller and the Carnegie Foundations.

Dali, Salvador (1904-), surrealist painter, was born in Figueras, Spain. A friend and admirer of his fellow countryman, the Cubist Picasso, Dali was expelled from the Academy in Madrid for insubordination. In Paris he found himself with surrealism, the newest of the modern art theories in 1928, which extols psychoanalysis in art, the projection of the subconscious mind upon canvas. Dali has been co-producer of the two surrealist films, *Le Chien Andalou* and *L'Age d'Or*. New York saw an exhibition of his work in 1934, and London in 1936. Among his paintings is *City of Drawers*, which is owned by the Museum of Modern Art in New York. Dali came to the U. S. to live in 1940. His book *The Secret Life of Salvador Dali* appeared in 1943.

Dalin, Olof von (1708-63), the principal representative of Swedish literature in the first half of the 18th century. He was the author of the epic *Svenska Friheten*, 1742; a tragedy, *Brynhilda*, 1738; a comedy, *Den Afundsjuke*, 1738. Consult Warburg's *Olof von Dalin*.

Dalkeith, town, Midlothian, Scotland. The chief glory is Dalkeith Palace, seat of the Dukes of Buccleuch, erected in 1700; p. 7,019.

Dall, Caroline Wells Healey (1822-1912), American author and reformer. Her published works include: *Woman's Right to Labor*, 1860; *The College, the Market, and the Court*, 1867.

Dall, William Healey (1845-1927), Am. naturalist, son of Caroline Dall. He was chief of scientific corps of the International Telegraph Expedition to Alaska in 1865-8, palæontologist to the U. S. Geological Survey; and professor in the Wagner Institute of Science, Philadelphia, from 1893. His

publications include: *Scientific Results of the Exploration of Alaska*, 1865-74, *Marine Mollusca of the Atlantic Coast of the United States*, 1889; *Contributions to the Tertiary Palæontology of the Pacific Coast*, 1909.

Dallas, county seat of Dallas co., situated on the Trinity River; is an important railway centre in a rich cotton, corn, wheat, alfalfa, and fruit district, and is the chief wholesale jobbing and manufacturing centre in the State, and the largest inland cotton market in the world. It has grain elevators, foundries, machine shops, meat-packing houses, and manufactures of cotton-ginning machinery, lumber, textiles, cotton, cotton-seed oil, and farm implements.

In Dallas are Southern Methodist University, University of Dallas, St. Mary's College and other educational institutions. Dallas is the headquarters of a Federal Reserve Bank; p. 294,734.

Dallas, Alexander James (1759-1817), American financier and executive, was born on the island of Jamaica. He was secretary of the commonwealth of Pennsylvania, U. S. district attorney for the eastern district of Pennsylvania and in 1814 he became Secretary of the Treasury under President Madison. He was instrumental in the establishment of the second U. S. Bank, 1816, and the passage of the protective tariff act of 1816. Consult *Life*, by his son.

Dallas, George Mifflin (1792-1864), Vice-President of the United States during Polk's presidency, was born in Philadelphia, Pa. After practising law he became successively mayor of Philadelphia; U. S. district attorney; member of the U. S. Senate and U. S. minister to Russia. In 1845-9 he was Vice-President of the United States; and from 1856 to 1861 U. S. minister to Great Britain. He wrote *Letters from London*, 1869-70, and edited a *Life* of his father.

Dalles, or **The Dalles**, city, Oregon, county seat of Wasco co., on the Columbia River; has flour and planing mills, machine shops, box factories, and canneries, and there is a considerable trade in wool, grain, fruit, and salmon. The Dalles, or rapids, obstruct navigation above but a canal between Dalles and Celilo provides a passageway around this barrier; p. 5,883.

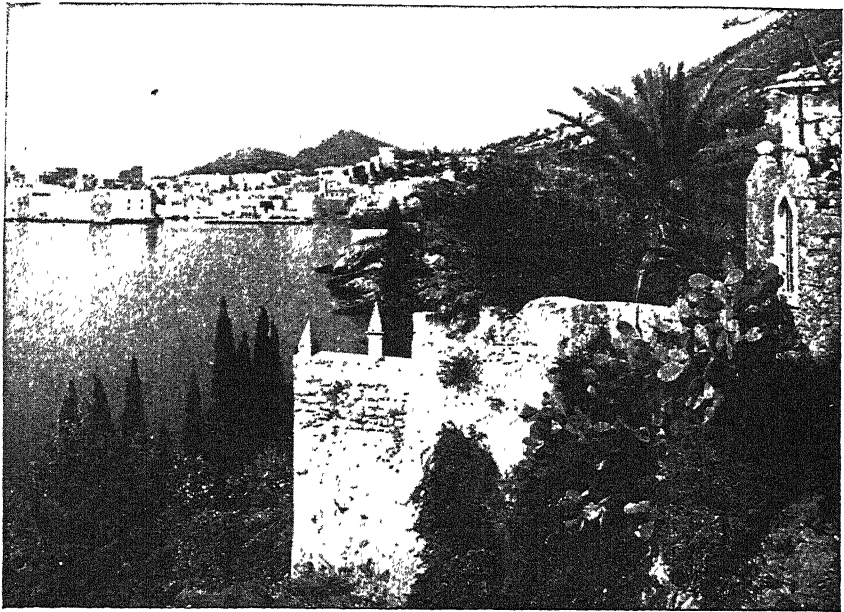
Dalles-Celilo Canal, a canal between the towns of Dalles and Celilo, Oregon, on the Columbia River, begun in 1908 and opened to traffic in 1915. The Canal passes around the rapids and makes possible uninterrupted transportation from Lewiston, Idaho, on the

Snake River, to the mouth of the Columbia, a distance of 479 miles. The length of the canal is about $8\frac{1}{2}$ miles.

Dallin, Cyrus Edwin (1861-1944), Am. sculptor, was born in Springville, Utah. His more important works include *Signal of Peace*, now in Lincoln Park, Chicago; *Sir Isaac Newton*, U. S. Library of Congress; *Pioneer Monument*, Salt Lake City; *Don Quixote*; *Medicine Man*, now in Fairmount Park, Philadelphia; *Appeal to the Great Spirit*, Boston Museum of Fine Arts; *The Redskin's Prayer*; *The Scout*, awarded a gold

in the n.w. of the Balkan Peninsula, and on the Balkan Sea of Yugo-Slavia. Its total area is about 4,956 sq. m.

The surface is generally mountainous, including the western chains of the Dinaric Alps and the Karst plateaus. The climate is subtropical, and is greatly influenced by the chilling, gusty *bora* of winter and the violent s.w. wind at other seasons. Fishing, fruit-growing (including the vine and olives), seafaring, shipbuilding, and transit trade are the chief occupations. There is a famous lace school in Spalato, some silk manufacture, and



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View on the Dalmatian Coast. Naval base at Ragusa.

medal at the Panama-Pacific Exposition, placed permanently in Kansas City, Mo.

Dallinger, William Henry (1841-1909), English biologist, was born at Devonport; published *The Creator, and what we may know of the Method of Creation*, and edited Dr. Carpenter's *Microscope and its Revelations*.

Dallmeyer, Johann Hein (1830-83), German optician, was born in Loxten, Westphalia; introduced numerous improvements in photographic lenses and object glasses, inventing and patenting a single wide-angle lens.

Dalmatia, formerly a kingdom and crownland of the Austro-Hungarian empire,

a cement industry of considerable importance.

The people of Dalmatia are mostly of Croatian-Serbian origin, but Italians predominate in Zara; and Austrians, Hungarians, and Poles are found. The peasant dress is mediæval, but the younger generation is adopting modern costume. The antiquities of Dalmatia are of special interest—particularly the Roman monuments, of which the most noteworthy are the Palace of Diocletian at Spalato covering $9\frac{1}{2}$ acres and dating back to between 290 and 310; and extensive remains at Salona, including ruins of a theatre, amphitheatre, city walls and gates, and fragments of houses, arches, baths, and basilicas.

Dalmatia anciently formed a part of Illyria. It was conquered by the Romans in the time of Augustus; was later occupied by the Slavs; and in the Middle Ages was, with the exception of Ragusa, divided between Hungary and Venice. The Turks occupied the greater part of Venetian or modern Dalmatia in the 16th century, but the territory reverted to Venice in 1699. In 1797 it was ceded to Austria, in 1805 to France, and in 1815 to Austria-Hungary, of which it became a crown land. It became a province of Italy, 1941. Consult Jackson's *Shores of the Adriatic*, 1908; Holzbach's *Dalmatia*, 1908; Frothingham's *Roman Cities in Italy and Dalmatia*.

Dalmatian Dog, or **Spotted Coach Dog**, a variety of dog half hound and half pointer by breed, which first came into fashion about 1820. The color should be white, with black or liver-colored spots, not more than an inch in diameter, regularly distributed over the body, including the ears and tail. The Dalmatian is valuable as a watch dog, and is sometimes trained to be a shooting dog. Its proper weight is 50 to 55 pounds.

Dalmatic, an ecclesiastical vestment, the official dress of the deacons of the Roman Catholic Church; worn by bishops when celebrating mass. It is a long robe with sleeves, open on each side, formerly white with purple stripes, but now colored.

Dalmou, city of Oudh, on the left bank of the Ganges, with a magnificent Hindu temple; p. 5,367.

Dalmeny, village, Linlithgowshire, Scotland; near it are the Forth Bridge, and Barnbougle Castle, the ancient seat of the Mowbray family. There are shale works near; p. including South Queensferry 4,442.

Dalmores, Charles (1871-1939), Fr. dramatic tenor, was born in Nancy. He sang in Brussels, and in Covent Garden, London; with the Manhattan Opera Company, New York City; and in the Philadelphia-Chicago Opera Company. Samson, and Herod are among his best known rôles.

Dalny, Ta-lien-wan, Dairen, or Tairen, seaport town, Kwantung Territory, Manchuria, on the s. shore of Ta-lien-wan Bay. It is connected by rail with Port Arthur. It has a fine icefree harbor protected by a 1,000-yard breakwater. Dalny was leased to Russia in 1898, nominally, for a period of twenty-five years. It figured prominently in the Russo-Japanese wars, in naval actions, and in 1904 it fell into the hands of the Japanese. The lease was then transferred to Japan by the Portsmouth Peace Conference, and in

1915, the Chinese extended the lease to 99 years. It is now the Japanese seat of administration for the territory of Kwantung; p. 204,000.

Dalou, Jules (1838-1902), French sculptor, was born in Paris. One of his most striking works is the bas-relief, *The States-General*, in the Chamber of Deputies at Paris; and another is the colossal group representing the *Triumph of the Republic* in the Place de la Nation, Paris. Consult Dreyfous' *Dalou*, 1903.

Dalriada, the ancient name of a territory in Ireland, now called 'the Route,' or the northern half of County Antrim. Its inhabitants were Scots of Gaelic race.

Dalrymple, Alexander (1737-1808), first hydrographer to the British Admiralty, was born at New Hailes.

Dalrymple, Sir David, Lord Hailes (1726-92), Scottish judge, was born in Edinburgh. He is remembered for his controversies with Hume and Gibbon which are embodied in his 'An Inquiry into the Secondary Causes which Mr. Gibbon has assigned for the Rapid Growth of Christianity,' one of the many replies made to the famous 15th and 16th chapters of the 'Decline and Fall of the Roman Empire.' The best known of his publications is his *Annals of Scotland*. Consult Boswell's *Life of Johnson*.

Dalton, town, Berkshire co., Massachusetts; has manufactures of machinery, textiles, and paper; p. 4,206.

Dalton, city, Georgia, county seat of Whitfield co. The region is rich in iron, manganese, and sedimentary deposits. Lumber, flour, textiles, iron, and machinery are the chief manufactured products. The largest publishing house s. of the Ohio River is located here, and cotton and grain are raised; p. 10,448. During the Civil War the Confederate General Braxton Bragg retired to Dalton after his defeat at Chattanooga and here his successor, Gen. Joseph E. Johnston, organized the defence against Sherman's invasion. The town was Sherman's first objective in the Atlanta campaign. Several minor battles were fought in the vicinity.

Dalton, John (1766-1844), English chemist, was born in Eaglesfield, Cumberland. His chief physical researches were those on the constitution of mixed gases, on the force of steam, on the elasticity of vapors and on the expansion of gases by heat. He distinguished himself in chemistry with the development of his atomic theory and other researches. He also made investigations regarding phenom-

ena of color-blindness, from which he suffered, and which is sometimes called *Daltonism*. He published *Meteorological Observations and Essays*, *The Constitution of Mixed Gases*, and *The Expansion of Gases by Heat*. See Sir Henry E. Roscoe's *John Dalton and the Rise of Modern Chemistry* (1895), also Roscoe and Harden's *A New View of the Origin of Dalton's Atomic Theory* (1896), and *New System of Chemical Philosophy*.

Daltonism. See **Dalton, John**.

Daly, (John) Augustin (1838-99), American dramatist and manager, born at Plymouth, N. C. The list of Daly's plays and adaptations is said to number seventy-five. He undertook the management of the old Fifth Avenue Theatre in Twenty-fourth Street, New York, in 1869, and he there gathered about him the earlier members of the stock company that made him famous. The Twenty-fourth Street theatre was burned in 1873, and Mr. Daly then opened Daly's Fifth Avenue Theatre in Twenty-eighth Street, which he managed until 1877. In 1879 he resumed management at the new Daly's Theatre on Broadway, and remained in control until his death. He took his company to Europe in 1884, and met with such success in London and Continental cities in that and following seasons that in 1893 he built a London theatre for his performances, afterward known as Daly's Theatre. He published in book form, *Woffington: A Tribute to the Actress and the Woman* (1888).

Dalyell, or Dalzell, Thomas (1759-1885), British general, fought for Charles II. at Worcester (1651); took part in the Highland rebellion of 1653-4; in Russia, he served against the Poles and Turks. Recalled in 1665, he was made commander-in-chief in Scotland against the Covenanters, his severities after the victory of Rullion Green made him both dreaded and hated. See *Memoirs of Captain Creighton* in Swift's works.

Dalziel, par., N. Lanarkshire, Scotland, on river Clyde, has important coal mines. Steel and iron are manufactured at Motherwell, most of which is included in this parish; p. of par. 47,501.

Dam. See **Dams**.

Damages. The pecuniary compensation awarded by a court of law for the violation of a legal right. An action for damages is the usual remedy for the more common legal wrongs, such as breach of contract and tort, but it is not always the sole remedy even in such cases and in many other classes of cases it does not exist at all. In the strict sense

of the term an action for a debt or penalty, like a suit for the recovery of a definite parcel of land, is not an action for damages, that term being technically appropriate only of an award made by a judge or jury when the damages sustained are a matter of estimate; but in practice any pecuniary award, whether 'liquidated' or 'unliquidated,' is described by the term damages. There are general rules governing the measure of damages. Perhaps the only one applicable to all kinds of cases is the rule that excludes the remote and improbable consequences of the wrongful act on which the action is founded. On the other hand, any result, however remote in point of time, which is the natural and probable consequence of the defendant's act, such as the loss of the probable profits of a voyage, may be included in the award of damages.

In certain classes of actions based upon or involving personal wrongs of an injurious character, such as libel, slander, seduction, false imprisonment, and malicious prosecution, 'exemplary' or 'vindictive' damages may be awarded. The question of the amount of damages to be awarded, especially where these are unliquidated, is usually for the jury to determine, though this discretion is exercised by the jury under the supervision and subject to the control of the court, which may set aside a verdict of excessive or wholly inadequate damages. See Sedgwick on *Damages*.

Damage to Property. One person may damage another's property unintentionally or maliciously, and in either case he must make good the loss, but if the loss or injury be caused by inevitable accident or, as it is called, by the act of God, while in a bailee's possession, there can be no recovery for the damage done. See **DAMAGES** and **MALICIOUS INJURY TO PROPERTY CARRIERS**.

Damanhur, or Demanhoor, tn., Egypt; occupies the site of the ancient Hermopolis Parva.

Damao or Damin, tn. and dist. in Gujarat, India. Was ceded, partly in 1558, partly in 1780, by the Marathas to the Portuguese, in whose possession it has since remained. It produces salt and textiles. Area, 169 sq. m.; p. 56,285.

Damaraland, central region of German S. W. Africa. The inhabitants are mostly engaged in cattle-rearing. The only good harbor, Walfish Bay, is British. Total pop. about 90,000, of whom 70,000 are the 'Cattle Damaras,' or Ova-Herero. See **GERMAN S. W. AFRICA**.

Damascening. This peculiarly Oriental art consists in decorating weapons and armor by first cutting into the metal fine furrows of the intended design, and then hammering into them threads of gold or silver, after which the blades, etc., are filed and polished. The art, which appears to have originated in N. India, was established at Damascus in the reign of the Emperor Domitian. See Hendley's *Damascening on Iron and Steel, as Practised in India* (1892).

Damascus, or **Esh-Sham**, the cap. of the Turkish vilayet of Syria. The city is beautifully situated on the Barada, in a plain of

van to Mecca. The chief exports of Damascus are inlaid wood and furniture, silken and cotton articles, sweetmeats, gum, woven cotton curtains, etc.; but trade is declining. The city is famous for its silk and cotton fabrics, gold and silver work, saddlery, attar of roses, perfumes, and carpets. Damascus, or 'damascene plums,' derive their name from this city; p. variously estimated at 225,000 to 318,900.

The Assyrians conquered Damascus in 806 and 732 B.C., after which it passed successively under the domination of the Persians, of Alexander the Great's successors, and of



De Cou, from Ewing Galloway, N. Y.

'Damascus: A Street in the Suburb of Meidan.

great fertility, and is encircled on three sides by Anti-Lebanon. It still contains some very fine old Mohammedan houses. The great feature of Damascus is the world-renowned Ommiade mosque. It was built originally as a heathen temple, restored by the Roman emperor Arcadius early in the 5th century, turned into a Christian church, then taken by the Moslems and converted by the caliph Walid about 710 into a mosque. This gorgeous building was destroyed by fire in 1069. Tamerlane, when he conquered Damascus, 1401, set it on fire; and in 1893 it was again terribly injured by fire, but since then has been restored. Among other places of interest are the 'street called Straight,' the Jews' quarter, in the s. of the city; 'the Gate of God' through which passes the pilgrim cara-

van to Mecca. It was taken by Pompey in 64 B.C., but did not become part of the Roman empire until 105 A.D. St. Paul visited the town, after which Christianity spread rapidly in and around it. The Arabs conquered it in 635, and it was the capital of the caliphate from 660 to 753, preceding Bagdad. In 401 it was sacked by Tamerlane. It was taken in 1516 by Selim I., sultan of the Osmanli Turks, and except for a short interval (1832-40), when it was in the hands of Mehemet Ali of Egypt, remained a Turkish possession until 1918. On Oct. 1, 1918, it was captured by British forces under General Allenby.

Damask, an elaborately woven silk, originally made at Damascus. True damasks are composed wholly of silk of a single color, with flat figures in various patterns, the figures be-

ing formed by contrast between warp and filling surfaces. The art of weaving damask was carried by the crusaders to Byzantium, where it greatly flourished; thence it passed to Lucca in Italy in the 13th century, from there it made its way into France and Flanders. It was introduced into England by the Flemish weavers.

Damaskeening. See **Damascening**.

Damasus I. (366-384), a native of Portugal, became Pope in 366, after a sanguinary struggle in the streets and churches of Rome against his rival Ursinus. Damasus was canonized after his death, his festival occurring on Dec. 11.

Damasus II., a native of Bavaria, was chosen Pope in 1048 but died twenty-three days after his election.

Dame Schools, private elementary schools taught by women in England and the United States. They were common in the 18th century and continued popular until the general establishment of public primary schools in the first half of the 19th century.

Dame's Violet, or **Damask Violet**, a plant belonging to the natural order Cruciferae. It is a hardy perennial with ovate lanceolate leaves and large lilac-colored flowers particularly fragrant at night.

Damghan, town, Persia, in the province of Semna va Damghan, on the southern slopes of the Elburz Mountains; is believed to mark the site of the ancient Hekatompylos, but this is more or less speculative; p. 15,000.

Damiani, Pietro (1007-72), Roman Catholic ecclesiastic and reformer of the Italian Church, was born in Ravenna; was appointed cardinal and bishop of Ostia; stood in close relationship, as adviser and censor, to the reigning Popes, particularly Gregory VII., and also endeavored to effect reforms through his influence over the German Emperors.

Damien, Joseph, better known as Father Damien, 1841-89, Belgian priest, was born near Louvain; was sent to the South Seas as a missionary, and in 1873 settled on the island of Molokai, Hawaii, devoting the remainder of his life to the lepers in the government hospital there. In 1885 he contracted leprosy but continued his heroic labors until his death. Robert Louis Stevenson vindicated Damien's memory in his *Open Letter to the Reverend Dr. Hyde*.

Damiens, Robert François (1715-57), French fanatic who attempted, in 1757, to assassinate Louis XV. He was executed at Paris with great barbarity.

Damietta, river port and episcopal see,

Lower Egypt, on the right bank of the Damietta branch of the Nile. The European quarters, which lie upstream, contain the Government Hospital, Coastguards Barracks, the university and the mosques of Gâmi-el-Bahr and El-Matbuliyeh. There are manufactures of cotton and silk and fish and eels are exported. In the 11th century Damietta became the chief port in the delta. It was attacked several times by the Crusaders, and was captured by Louis IX. in 1249, but in the following year was restored to the Saracens who demolished it, and in 1260 built the present town. In 1798 it was taken by the French; in 1799 Kléber here defeated the Turks;



Walter Damrosch.

but the French were driven out by the British under Sir Sidney Smith; p. 34,907.

Dammar, a genus of Coniferae, of which there are four species, all oriental, or Australasian. The most familiar is (*Dammara orientalis* of the Malay Archipelago and the Philippines, chiefly valuable for its extraordinary abundance of resin.

Damocles, a friend of Dionysius I., despot of Syracuse during the earlier part of the 4th century B.C., who illustrated to him the happiness of princes by setting him at a magnificent feast with a sword suspended over his head by a single hair.

Damodar, river of Bengal, India, rises in Chutia Nagpur. and flowing s. e., falls into the Hugli.

Damon and Phintias (incorrectly Pythias), two Pythagorean philosophers of Syracuse who stand as types of faithful friendship. When Phintias was condemned to death for plotting against Dionysius, he asked leave to depart to arrange his affairs and Damon offered himself to be put to death should Phintias fail to return. The latter arrived just in time to prevent his friend's fulfilment of the pledge, and was pardoned.

Dampier Archipelago, a group of small rocky islands, off the coast of Western Australia.

Dampier Strait, a strait separating New Guinea from Waygiou Island, off the n.w. coast.

Dampier, William (c. 1652-1715), English seaman and buccaneer, was born in East Coker, Somersetshire. After a variety of sea adventures Dampier set out for a voyage around the world. He published subsequently, his *Voyage round the World* (1697). Later as a government deputy, he explored the western and northwestern coasts of Australia, also the coasts of New Guinea and New Britain, giving his name to Dampier Archipelago and Strait.

Damping Off, a plant disease due to a fungus, *Pythium debaryanum*, affecting especially young plants and seedlings.

Damrosch, Frank Heino (1859-1937), American musician, son of Leopold Damrosch, was born in Breslau, Silesia. In 1884-5, he came to New York, acting as chorus master at the Metropolitan Opera House until 1891. The following year he organized the New York People's Singing Classes. In 1897 he was appointed supervisor of music in the New York City public schools, and the following year was elected conductor of the New York Oratorio Society. When he severed his connections with the public schools in 1905, he became organizer and director of the Institute of Musical Art.

Damrosch, Leopold (1832-85), German-American musician and composer, was born in Posen, Prussia. He was conductor (1859-60) of the Breslau Philharmonic concerts, and founded the Breslau Orchestral Society.

Damrosch was called to New York in 1871 as conductor of the Arion Society. Two years afterward he organized the Oratorio Society, and in 1877 he founded the Symphony Society, directing both, and combining them in the first musical festival held in New York

(1881). In 1884 he gave a season of German opera at the Metropolitan Opera House in New York, introducing a movement that proved important and lasting. He died early in 1885 from a cold contracted while conducting one of these performances. His own compositions included seven cantatas, numerous songs, and several important pieces for the violin.

Damrosch, Walter Johannes (1862-), American musician, son of Leopold Damrosch, was born in Breslau, Germany. On the death of his father, he became assistant conductor and director of the German Opera Company, and also directed the Oratorio and Symphony Societies which he had founded. In 1896 he produced Wagner's *Parsifal*, for the first time in the United States, and subsequently founded the Damrosch Opera Company to produce only Wagnerian operas. After 1896 he organized the New York Symphony into a permanent orchestra. In 1927 he resigned to become musical director and lecturer for the National Broadcasting Company. Damrosch has written many compositions. See *My Musical Life*, an autobiography.

Dams. A dam is a barrier built to retain or divert a fluid body in order to store it for future use, exclude it from points where it would cause inconvenience or damage, change its direction or level, or produce pressure. Dams are most commonly thrown across a stream or a valley. Dikes, levees, and reservoir embankments forming reservoirs which are wholly artificial are essentially earth dams. Retaining walls are in many respects similar to dams. Dams are built of earth, timber, loose rock with water stop of some kind, stone or brick masonry, concrete, reinforced concrete, steel, and combinations of these materials. Many of the early dams in America, particularly those built to supply water power to saw-mills or other mills, were of timber construction, but the increasing cost of timber, increasing height of dams, and necessity for greater permanence have made their use impracticable except for temporary and other low dams in lumbering districts. Earth dams, of various kinds, masonry dams and, less frequently, rock fill dams, are all commonly used for permanent construction; the selection of type for any given location is a matter of utilizing local conditions and available material so as to provide the most economical dam consistent with safety.

The remains of ancient works and the existing native traditions and practises in In-

dia, Ceylon, and China prove that dam and reservoir building were practised in very early periods. Chinese history records the beginnings of the construction of the Grand Canal in 540 B.C. The most famous of the dams built in connection with this canal is Tai-ts' un Pa on the Wen River in Shantung. In Europe the best examples of early dams are in Spain. The earliest of ten notable old dams in that country are Almanza, built in 1586, of stone masonry, and Alicante, built in 1579-94. Important French dams were built at various dates, beginning with the Lamy dam in 1776. Zola built in about 1843, and Furens, built after 1858, are two of the most famous.

A dam must be heavy enough to resist the pressure of water and impervious enough to prevent escape of water by percolation through or under it. The cross section of a dam must be so shaped that not only the section as a whole but also the part above any horizontal plane will be stable, just as if any such part were the whole of a lower dam. An approximately triangular section with a truncated or thickened apex at the top has the necessary stability in the upper parts. The water pressure against the upper face of a masonry dam tends to slide the dam, to overturn it, and to crush the masonry at the down-stream toe. Failure of the dam may take place by any of these three methods, and may occur at the bottom or at any higher level. Ice pressure at the water level and upward pressure on the bottom of the dam or at any higher joint are additional forces which are sometimes provided for under certain conditions.

The supporting power and imperviousness of foundations for dams require especial care and study. Low masonry dams are frequently placed on sand or gravel, particularly overfall dams used in regulating rivers. High masonry dams require rock foundations, and the base of the dam must be sufficiently generous in width to avoid excessive pressures at the toe of the dam, both on the masonry and on the rock foundation. In earth dams the loads are spread over larger areas at less intensity, but care not to overload foundations is still required in such cases as levees built on a deep bed of yielding silt. It has become increasingly customary to bore vertical holes into rock foundations and fill all seams and crevices with thin mortar of Portland cement, forced in by air pressure. Core or heart walls of stone or cores of clay puddle or soil are also used to cut off the flow of

water. It is aimed to have all these cut-offs make a junction with reasonably impervious sub-strata to prevent excessive underflow, but where relatively pervious strata continue to a prohibitive depth, the necessary degree of tightness is sometimes obtained by extending tongued and grooved wooden or sheet steel piling below the bottom of a core trench excavated to liberal depth.

The up-stream face of earth dams is generally protected by stone or concrete paving from the wash of waves. Tight paving or masonry core walls, particularly the latter, are safeguards against boring creatures such as muskrats and crayfish, which have been the supposed cause of the washout of some small dams. Overfall dams generally have their tops and down-stream faces curved to give an easy surface for the water and shoot it clear of the toe, so that excessive erosion on the foundation will be avoided.

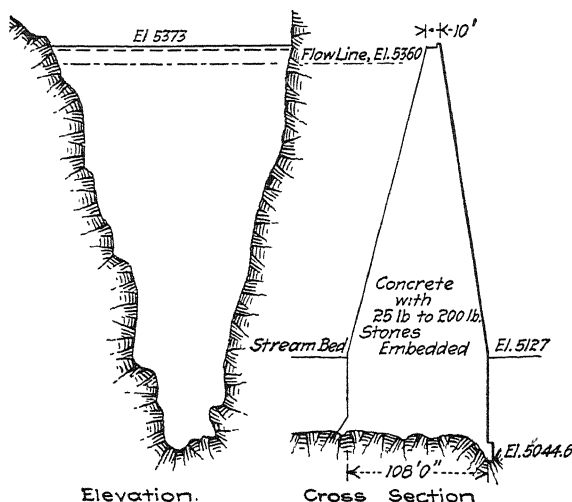
Earth dams are in cross section similar to highway or railroad embankments, having relatively narrow tops and sides on slopes not too steep for stability. The similarity is only superficial, however, since dams must be bonded in a water-tight manner with the foundation, and must be thoroughly compacted to prevent undue loss of water or destruction by washing out. Earth dams are constructed in several ways or by combinations of these ways. The oldest and most common method is to transport the earth to the dam; spread it in layers from 4 to 12 inches thick, and compact it with steam or horse-drawn rollers, tractors, or herds of horses. Another method is to dump the earth into pools of water on the dam and rely on compactness gained by hydraulic subsidence.

Still another method is to dislodge the material by hydraulic giants and sluice it to the edges of the dam, thus building the edges up higher with the coarser material, and forming a pool of water along the center of the dam into which runs the water bearing the more easily transported residuum of sand and fine silt. The pool along the centre of the dam is kept at a determined but progressively higher level by special drains generally extending down through the dam, so that the fine material which settles out from the water is limited to a predetermined proportion of the width of the dam. The fine material in the centre forms an effective water-stop and takes the place of masonry heart wall, clay puddle core, or top soil core. Instead of sluicing earth material down from higher hill-sides into the dam, material is often trans-

ported to pumps and pumped up with water to the dam. A similar method is to pump in material sucked up from nearby waters by hydraulic dredge.

A recent adaptation of hydraulic-fill methods consists in the use of powerful hose streams to force the material from dumping tracks near the faces of the dam toward the centre of the dam. All kinds of masonry have been used for dams: cut stone, rubble stone, concrete with or without large stones

the United States there has been great activity in the construction of very high masonry dams since about 1890 for the water works of large cities, notably New York, Boston (Mass. Metropolitan District) and San Francisco; for irrigation, notably by the U. S. Reclamation Service in the West; and for water power, largely in the south and on the Pacific coast. Among the most famous of these dams are the New Croton (1892-1910) 297 feet maximum height; Hetch



Shoshone Dam.

embedded, rarely brick, loess-lime fill, and combinations of these. Masonry dams are of several kinds: *Gravity*, depending for stability on weight alone; *arch*, forming a horizontal arch, with convex side up-stream, across a narrow steep-sided, rocky valley and relying for stability on arch thrust against the sides of the valley which act as arch abutments; combinations of arch and gravity dams; *multiple-arch*, consisting of piers or buttresses with sloping arches between; *reinforced concrete slab*, consisting generally of piers against the up-stream ends of which is laid a sloping face slab of reinforced concrete bonded into the bottom of the valley to prevent leakage beneath it.

There are many noble examples of high gravity dams distributed over many countries. Among the most famous foreign dams are the Vyrnwy in England (1882-90) 162 feet maximum height; Assuan (1898-05, increased in height 1911), used for irrigation on the Nile, 147 feet maximum height. In

Hetchy, for the San Francisco Water Supply and hydro-electric development; and the following dams of the U. S. Reclamation Service: Roosevelt (1905-11) in Arizona, 284 feet maximum height; Arrowrock (1912-15) in Idaho, maximum height 351.

Steel dams are formed by riveting steel plates to a frame work of steel, and anchoring the whole to rock. They are of recent origin and are few in number. Movable dams are constructed mostly in connection with locks, on rivers which are being improved for navigation. Their purpose is to allow flood waters to pass so as to avoid raising the water level too high up-stream from the dams. They include needle, wicket, bear-trap, and roller types, some of which come into action automatically. See COFFERDAM; EMBANKMENTS; RESERVOIRS; RETAINING WALLS. See also BOULDER DAM.

Consult Bassel's *Earth Dams*; Schupler's *Reservoirs*; Flinn, Weston and Bogert's *Water Works Handbook* (1916); Wegman's *De-*



CONE FLOWER AND FIELD DAISY

The cone flower is also known as black-eyed-Susan, yellow daisy ox-eye daisy, cornflower and golden Jerusalem

sign and Construction of Dams (7th ed. 1922). Beginning in 1933 under the Public Works Administration of the Department of the Interior, many reclamation and irrigation projects have been launched in the United States. The most notable is the Tennessee Valley project of which three dams, the Norris, Wheeler, and Pickwick Landing, were completed in 1935, 1936, and 1938, and the Guntersville and Chicamauga in 1939 and 1940. The Bonneville Dam was completed in 1937 and the Grand Coulee in 1941. From the Bonneville and Grand Coulee projects, power will be distributed over the Pacific Northwest. Boulder Dam, on the Colorado River, completed in 1936, is the highest dam in the world, and furnishes power to cities as distant as Los Angeles, in California. Fort Peck Dam, on the Missouri River in Montana, completed in 1940, is the largest earth-filled dam in the world.

Important among dams completed abroad recently are the Sautet and Maresges dams in France, the latter being 295 feet high, used largely for power development.

Dan, a tribe of Israel, the ancestor of which was the elder of the two sons of Jacob and Bilhah.

Dan, a city on the extreme northern border of Palestine, originally known as Laish, but conquered and renamed by the tribe of Dan. It is probable that Dan was the present Hellel-Kâdi.

Dana, Charles Anderson (1819-97), American journalist, was born in Hinsdale, N. H.; joined the staff of the *New York Tribune* in 1847. He became a stockholder in, and managing editor of, the *Tribune*, a position he held until 1862. He then was for a time, 1863-4, assistant secretary of war. In 1868 he became a proprietor and the editor of the *New York Sun*, in which capacity he continued for the rest of his life, making it a model of terse record, comment, and criticism.

He wrote: *The Art of Newspaper Making*, 1895; *Lincoln and His Cabinet*, 1896; *Life of General Grant* (with Gen. J. G. Wilson). Consult J. H. Wilson's *Life*, 1907.

Dana, Charles Loomis, (1852-1935), American neurologist, born in Woodstock, Vt. His *Text Book of Nervous Disease and Psychiatry* is standard and he made many contributions to neurology.

Dana, Francis (1743-1811), American jurist and patriot, was born in Charlestown, Mass. He was a delegate to the Continental Congress, 1776-78. In 1779 he was secretary of legation in Paris, and in 1781-83, U. S.

Minister to Russia. In 1785 he was appointed a justice of the Supreme Court of Massachusetts, and in 1791 chief justice.

Dana, James Dwight (1813-95), American geologist and mineralogist, was born in Utica, N. Y., was mineralogist and geologist with the Wilkes Exploration Expedition to the Southern and Pacific Oceans, 1838-42. His text books on mineralogy and geology are standard authorities, and include: *A System of Mineralogy*; *Text Book of Geology*; *The Geological Story Briefly Told*. From 1846 until his death he was editor of *The American Journal of Science*. Consult *Life*, by his son.

Dana, Napoleon Jackson Tecumseh (1822-1905). American soldier; served in the Mexican and Civil Wars. He became major-general of volunteers, and commanded successively the District of Vicksburg, the Sixteenth Army Corps, and the Department of the Mississippi.

Dana, Paul (1850-1930), American journalist, son of Charles A. Dana, was born in New York City. In 1880 he joined the staff of the *New York Sun*, and in 1897 succeeded his father as editor, retiring in 1903.

Dana, Richard (1699-1772), American jurist, was born in Cambridge, Mass.; took a prominent part in the movement of the colonists to resist the imposition of unjust taxes by the British government; was also a member of the committee which investigated the Boston Massacre.

Dana, Richard Henry (1787-1879), American poet and novelist, son of Francis Dana. He became associate editor of *The North American Review* in 1818. He published *Poems and Prose Writings* and other poems.

Dana, Richard Henry (1815-82), American author, son of Richard H. Dana, was born in Cambridge, Mass.; published the *Seaman's Friend*, a manual bearing on the relations of masters and sailors, as well as an edition of Wheaton's *International Law*. Consult Adams' *Richard Henry Dana*.

Dana, Richard Henry (1851-1931), American lawyer, the son of R. H. Dana, was born in Cambridge, Mass. In 1878 he married Edith Longfellow, daughter of the poet. He organized the Associated Charities of Boston, 1878, drafted the Civil Service Reform Act of Massachusetts, 1884, and the first Australian ballot law in operation in the United States (Massachusetts, 1888), and was chosen president of the National Civil Service Reform League. His writings in-

clude: *Double Taxation in Massachusetts*, 1895; *The Corrupt Practices Act*, 1906; *The Australian Ballot System of Massachusetts*, 1911.

Dana, William Parsons Winchester, 1833-1927, American artist, was born in Boston, Mass. Among the best known of his works are *Solitude*; *Heartsease*; *Emby's Admiral*.

Danaë, the daughter of Acrisius, king of Argos. An oracle having announced that she would one day give birth to a son who should kill his grandfather, Acrisius shut her up in a dungeon, where she was visited by Zeus in a shower of gold and became the mother of Perseus. Acrisius next put both the mother and child into a chest, and exposed them on the sea. The chest, however, drifted ashore on the island of Seriphos, and Danaë and her child were saved. She accompanied Perseus to Argos. On his arrival, Acrisius fled, but was subsequently slain accidentally by Perseus at Larissa.

Danaïdæ, or **Danaïs**, a genus of tropical butterflies, which includes certain species noteworthy for their protective coloration.

Danaïdes, the daughters of Danaüs, fifty in number, who married the fifty sons of Ægyptus and, in obedience to their father, slew their husbands on their wedding night, with the exception of Hypermnestra, who spared her husband Lynceus.

Danakil, the Arab name for one of the Ethiopic branches of Hamitic race, inhabiting the southwestern shore of the Red Sea and the highlands of Abyssinia.

Danao, pueblo, Cebu Island, Philippines, on the e. coast. The town is very old; there are coal mines in the vicinity; p. 22,581.

Danaüs, in Greek mythology, the son of Belus and twin brother of Ægyptus, originally ruler of Libya. Tradition says that he built the acropolis of Argos.

Danbury, city, Connecticut, Fairfield co. Prominent buildings are the State armory, State normal school, and city hospital. The city stands first in the United States in the manufacture of hats. Other manufactures include paper and wooden boxes, underwear, silk, felt, silverware, cutlery, and electrical supplies; p. 22,339.

Danbury Hatters Case. See **Boycott**.

Danby, Francis (1793-1861), Irish landscape painter, was born at Common in Wexford, Ireland. He won fame by *The Upas Tree*; other important works are: *Departure of Ulysses from Ithaca*, 1854; *Fisherman's Home*, *Sunset*, Tate Gallery, London.

Danby, Frank (1864-1916), pen name of Mrs. Julia Frankau, English author. Her published works include *Nelson's Legacy*, 1915, *The Story behind the Verdict*, 1915.

Dance, George (1741-1825), English architect, was born in London. He designed Newgate Prison, and was professor of architecture at the Royal Academy, 1798-1805.

Dance of Death, Todtentanz, or Danse Macabre, an allegorical representation of the supremacy of Death over mankind, in which all ages and all conditions of men are represented in a sort of dramatic progression. *The Triumph of Death*, painted by Orcagna on the walls of the Campo Santo at Pisa, in the 14th century, is one of the earliest known pictorial renderings of the theme. The same subject was pictured on the walls of the Dominican cemeteries of Basel and Bern. Frescoes of the Dance of Death formerly existed on the walls of the Tower of London, the cloister of St. Paul's, and in many other churches of England. Holbein is pre-eminent-ly associated with this subject, which he illustrated in a series of wood cuts, each containing two or three figures.

The Dance of Death was, however, primarily a dramatic performance, and was undoubtedly enacted in or near churches by religious orders in Germany, France and Spain during the 14th century. About the middle of the 15th century, the drama being altogether laid aside, the pictures became the main point of interest. It long survived in England in the form of the allegorical drama, *The Shaking of the Sheets*, or *The Dance of Death*. Consult Douce's *Holbein's Dance of Death*; Deuchar's *The Dances of Death*; Peignot's *Recherches sur les Danses des Morts*; Seelmann's *Die Todtentanze des Mittelalters*.

Dancette, the zigzag form of ornamentation common in Saxon and early Norman architecture. In Heraldry, one of the lines of partition. See **CHEVRON**.

Dancing, a form of exercise or amusement in which one or more persons make a series of movements with measured steps in accord with music. In its most refined phases, dancing expresses the poetry of rhythmic movement, and rises to the level of an art. In its earliest forms among simple races it is a mode of outward expression for strong emotions of joy and sorrow, love and rage, and even for the most solemn and impassioned religious feelings; in more civilized strata of human society it is employed as a means of recreation and amusement.

Dancing corresponds to a universal primitive instinct in man. In many parts of the world, and in every age, it has been the custom to arouse the battle fury, as well as to celebrate the conclusion of peace, by means of dancing. Into savage dancing, moreover, the idea of magic frequently enters. The Mandan Indians perform their buffalo dance to bring game when supplies of food are low; the rain doctors of Central Africa dance mystic dances to bring down rain; and the wives of Gold Coast negroes dance a battle dance to give their absent husbands courage in the fray. Dancing attained high excellence among the ancient Greeks, where it ranked with the arts of poetry and music. The intricacy and variety of rhythm of the Greek dance are embodied in the poetry of Æschylus, Aristophanes, and others, and its beauty of pose and movement in the works of the great sculptors. Many of the mediæval dances were solemn and stately in character, like the *danses basses*, danced to psalm tunes at the court of Charles ix. of France. The more lively galliarde and volta were introduced into France from Italy by Catherine de' Medici; but it was not till the reign of Louis xiv. that dancing reached its height in France, where a Royal Academy of Dancing was founded in 1661.

The Quadrille, probably the oldest of popular dances, was known in Europe for centuries before its modern revival in the first decade of the 19th century. The Waltz, of German origin, and dating from the 14th century, became fashionable in the days of Napoleon, and since that time has enjoyed uninterrupted popularity. The Polka, a Bohemian dance, became popular about 1835, and had a great vogue throughout Europe during the middle of the 19th century. The Lancers was also introduced about 1835; the Schottische, which resembles the polka, about 1850. The Two Step, invented in America about 1890, enjoyed a high degree of popularity. The Cotillon, of French origin, holds a prominent place among fashionable dances in the United States; while the stately Minuet is still sometimes indulged in.

The Ballet, which has contributed much to modern dancing, was originally a carefully designed mimetic drama, and first attained high artistic value in Rome. The artistic traditions of the ballet, however, as created in Italy and France, were kept alive in the Russian Imperial School of Ballet, established in 1735, where the dance continued to be practised with elaborate technique.

During the past decade this form of dancing has received new inspiration largely through the efforts of Isadora Duncan, an American dancer. Well-known dancers of the Russian school are Pavlova, Lopoukova, Karsavina, Nijinsky, and Mordkin. Maud Allan and Ruth St. Denis have also sought to revive dancing as an art in the United States.

The Cake Walk, in which a cake was awarded to the champion, was popular in Ireland before 1680; was thereafter zealously adopted by the negroes of the Southern States; and in recent years enjoyed a temporary vogue among fashionable society. In the Orient, dancing is chiefly pantomimic, and is executed by trained dancers. The Bayaderes of India are professional mimes; in Japan are the Geisha dancers.

Vernon and Irene Castle revolutionized social dancing in the U. S. after 1912, originating the one-step, Castle walk, etc., and thereafter Latin and Negro dances influenced American dancing in varying degrees. Folk dancing has recently been revived.

Consult Grove's *Dancing*; Vuillier's *History of Dancing*; Gulick's *The Healthful Art of Dancing* (1910); Flitch's *Modern Dancing and Dancers* (1912); Mr. and Mrs. Vernon Castle's *Modern Dancing* (1914); Rath's *Æsthetic Dancing* (1914); R. Nijinsky's, *Nijinsky*, 1934.

Dancing Mania, an epidemic disorder allied to hysteria. Epidemics of this sort were common in Germany during the Middle Ages; in Italy, Tarantism, a somewhat similar disease, was ascribed to the bite of a spider called the tarantula; and similar convulsive affections have been witnessed in Abyssinia and India.

Dancourt, Florent Carton (1661-1725), French actor and dramatist, was born in Fontainebleau. Among his works are: *Le Chevalier à la Mode* (1687); *Le Galant Jardinier* (1704).

Dandelion, a common weed found in several varieties throughout Europe, and so extensively naturalized in North America that it is one of the familiar spring flowers. Its golden composite flower heads are easily recognized.

Dandie Dinmont, a breed of terriers of Scottish origin.

Dandolo, one of the twelve great families of Venice. ENRICO DANDOLO (1108-1205), doge, who helped the crusaders with money and ships, and accompanied them to Constantinople. He was the 'blind old Dandolo' of Byron's *Childe Harold*.—ANDREA DAN-

DOLO (1317-54), doge, personal friend of Petrarch, through his successful warfare against the Turks opened the ports of Asia Minor and Egypt to Venetian trade.—FRANCESCO DANDOLO, doge, under whose administration (1327-39) the Venetian sequin was first coined.—COUNT VINCENZO DANDOLO (1758-1819), a friend of Lavoisier and Berthollet, was appointed by Napoleon governor of Dalmatia.

Dandruff. See **Hair**.

Dandy Fever. See **Dengue**.

Dane, Nathan (1752-1835), American lawyer and legislator, was born in Ipswich, Mass., is best remembered as the joint author, with Manasseh Cutler, of the Ordinance of 1787, which he reported to Congress on July 11, 1787. He was a member of the famous Hartford Convention of 1814. He published *A General Abridgment and Digest of American Law* (1825-29).

Danebrog, a Danish order of knighthood, instituted by Christian v. in 1671, and remodelled in 1693 and 1808.

Danegeld, a tax levied by Ethelred the Unready, king of England, for the purpose of buying exemption from the attacks of the plundering Danes in 994.

Danelagh was the land granted to the Danes by Alfred the Great after their defeat by him at Ethandune in 878.

Danenhower, John Wilson (1849-87), American explorer, was born in Chicago, Ill., accompanied the *Jeannette* Expedition to the Arctic Ocean as second in command to Lieut. George W. De Long in 1879. He published *The Narrative of the Jeannette* (1882).

Danes Island is one of the numerous small islands which lie off the Spitzbergen group on the northwestern coast of West Spitzbergen.

Daniel. The Book of Daniel falls naturally into two parts—the history of Daniel at the Babylonian court, and his visions. In the first part Daniel rises to great eminence in the service of Nebuchadnezzar, chiefly by his skill in the interpretation of dreams. In the second part we have the visions of the four beasts, the man and the he-goat; the revelation of the meaning and of the experiences of the Jewish nation under subsequent rulers; finally, the assurance given to Daniel that he shall 'stand in his lot' in the coming restoration.

The unity of the book is the prevailing hypothesis. It was formerly believed to have been written in the 6th century B.C. by Daniel himself, but as early as the 3rd century A.D. the Neo-Platonist Porphyry assigned the

composition of the book to the reign of Antiochus iv. Epiphanes, about 165 B.C. Consult the Commentaries of Pusey, Bevan, Prince, Driver; Wright's *Daniel and His Prophecies* (1905).

Daniel, Antony (1601-48), French Jesuit, accompanied Champlain to Canada, and labored as a missionary among the Hurons.

Daniel, John Moncure (1825-65), American editor and soldier, born in Stafford co., Va.; edited the *Richmond Examiner*. From 1853 to 1861 he was U. S. minister to Sardinia. He published a *Life of 'Stonewall' Jackson*.

Daniel, John Warwick (1842-1910), American legislator, was born in Lynchburg, Va.; during the Civil War he served in the Confederate Army as adjutant-general on General Early's staff. From 1887 till his death he was a member of the U. S. Senate.

Daniel, Samuel (1562-1619), English poet, was probably born near Taunton, Somersetshire. His poems include: *Sonnets to Delia* (1592). Plays and Masques: *Cleopatra* (1594); *Philotos* (1604). Prose: *Defence of Rhyme* (1603); *History of England* (1612, 1617).

Daniels, Josephus (1862-), American editor and public official, was born in Washington, N. C. He served as State printer, 1887-93, and as chief clerk in the U. S. Interior Department, 1893-5. In 1894 he consolidated *The State Chronicle* with *The News and Observer*, of which he has since been the editor; was Secretary of the Navy under President Wilson. His publications include *The Navy and the Nation* (1919); *Our Navy at War* (1922); *Life of Woodrow Wilson* (1924). American ambassador to Mexico, 1933.

Danilo I. (1826-60), Prince of Montenegro, succeeded his uncle, Peter II., as *vladika* on Oct. 31, 1851. He was assassinated by Todor Kadic, a personal enemy.

Danish Church in America. See **Luth-
erans**.

Danish Language and Literature. See **Denmark**.

Danish West Indies. See **West Indies**.

Danites, a secret society, said to have been formed by Mormons about 1837 to exact blood vengeance from the Gentiles. It has been held responsible for the Mountain Meadows Massacre and other atrocities. Consult Miller's *Danites* (1910).

Dankara, or **Denkera**, native state of the Gold Coast, in Upper Guinea, West Africa, under an English protectorate.

Dannat, William A. (1853-1929). American figure painter. was born in Hempstead, L. I. Among his works are: *A Sacristy in Aragon*; *A Lady in Red* and *Aragonese Smuggler*; *A Quartette*.

Dannecker, Johann Heinrich von (1758-1841). German sculptor. was born in Waldenbuch, near Stuttgart. Among his works are: *Sappho*, *Psyche*, *Ariadne on the Panther*, *Christ*, *John the Baptist*. He also executed busts of *Schiller*, *Glück*, *Lavater*.

Dannemora, village and township. Clinton co., New York, the seat of Clinton State Prison, whose inmates are employed in the mining and manufacture of iron and on the highways; p. 6,362.

Dannemora, iron field in Sweden; 25 m. n.e. of Upsala.

D'Annunzio, Gabriele (1864-1938), Italian writer and political leader, was born near Pescara. His works include. *L'Isotto* (1885); *Odi Navali* (1893); *Canzoni della gesta d'Oltremara* (1912); *La Canzone di Garibaldi* (1901); *Il Piacere* (1889); *Sogno d'un Tramonto d'Autunno* (1898); *La Gioconda* (1899); and *Le Martyre de Saint Sébastien* (1911).

At the outbreak of the Great War D'Annunzio was in France but he at once urged Italian coöperation with the Allies. In 1915 he returned to Italy and volunteered for active service, eventually joining the aviation corps in which he attained high distinction. At the close of the War his bitter antagonism to President Wilson caused somewhat strained relations between the United States and Italy and the dispute over Fiume led him to head an expedition of volunteers into that city, where for fifteen months he ruled in defiance of his government's wishes. At length his refusal to recognize the Rapallo Treaty necessitated the use of force by the Italian government and he was obliged to leave Fiume. He was a strong supporter of Fascism. His later works include *Per la più grande Italia* (1915); *Notturmo* (1921); *La faville del Maglio* (1924). Most of his novels and plays have been translated into English.

Dan River, a river of Virginia, which with the Staunton forms the Roanoke.

Dansville, village, Livingston co., New York. Its nurseries are important, and there are manufactures of paper, pulp, woolen goods, flour, agricultural implements, oil condensers, and heaters; p. 4,976.

Dante Alighieri (1265-1321), the greatest poet of Italy, was born in Florence in May,

1265. Little is known of his early years. The year 1290 was one of great grief to the poet, for in it occurred the death of Beatrice, whom he had first met when he was nine and she eight years of age, and who had since then been the center of his life and aspirations. Dante's love was not returned, and he appears to have been fully resigned to the girl's marriage.



Gabriele D'Annunzio.

In order to qualify for participation in the government of the city, Dante joined one of the guilds and about the same time he married Gemma di Manetto Donati, by whom he had four children. In 1295-1300 Dante voted and was otherwise active in the public affairs of the city; and in 1300 he filled one of the highest offices. During his priorate he consented to the banishment of the heads of the Black and White Guelfs—the former being the partisans of Pope Boniface VIII., and eager for Charles of Valois to settle the affairs of Florence; while the latter were opposed to the papal schemes.

In October, 1301, Dante appears to have gone to Rome with an embassy charged to effect a settlement; and in his absence

Charles entered Florence and the following January Dante was sentenced to a heavy fine, and to temporary banishment for opposition to the Gueff party. In March, 1302, he was sentenced to be burned alive, if he should fall into the hands of the commune. He appears to have remained at or near Arezzo till 1304; but after a stay at the court of the Scaligers at Verona, he was a wanderer throughout Italy.

In 1316 Dante apparently had a chance of returning to Florence; but the conditions were not honorable, and he expressed his determination to refuse them in a beautiful letter addressed to a Florentine friend. His last refuge was with Guido Novello da Polenta at Ravenna, where he died. He was buried at Ravenna, where his remains still rest. Besides the *Commedia*, Dante wrote the following works, of which (1) to (3) are in Italian, and the remainder in Latin:

(1) The *Vita Nuova*, a pearl in the world's love-literature, consists of lyrics strung together by a prose narrative, and accompanied with a curious commentary to the verses in the scholastic manner. Its subject is Dante's youthful love for Beatrice. (2) The *Canzoniere* embraces 'poems connected with Beatrice and *La Vita Nuova*; poems of the second love, for the allegorical lady of the *Convivio*.' The first group is the 'overflow,' as it were, of *La Vita Nuova*, several of the pieces thus crowded out are in every way worthy of that work. The 'allegorical lady,' forming the subject of the second group, is the *donna gentile* who comforts the poet when Beatrice dies, and whom he subsequently identifies as 'Philosophy.' The third group is devoted to Dante's earthly loves. The three *canzoni* of the fourth group deal with Rectitude. (3) The *Convivio*, or 'Banquet' was undertaken by Dante with the double object of showing the Florentines what they had lost by exiling him, and of proving to the world that his whole youth had not been devoted to mere love-making. (4) The *De Vulgari Eloquentia* consists of two books. The first deals with the origin of language, with the Germanic, Greek, and Latin tongues, with Provençal, French, and Italian. The second book is occupied with a long dissertation on the *canzone* as the noblest form of lyrical poetry. (5) The *De Monarchia* is a most valuable book for students of the relations between church and state. The three books deal respectively with (1) the political and moral necessity of a universal monarchy; (2) the historical and natural

right of the Roman people to the world's dominion; and (3) the sharp division between the secular and spiritual authority. (6) Of the various Latin epistles which have been ascribed to Dante, some certainly are spurious, but four or five appear to be genuine. Among the latter are the three political epistles addressed to the princes and people of Italy, to the Florentines and to Henry VII. (7) The two Latin eclogues written by Dante in reply to two sent him by Giovanni del Virgilio of Bologna belong to the last years of his life, 1318-21.

The *Commedia*—which probably occupied Dante at intervals during about twenty or twenty-five years of his life, but which, to judge from certain historical allusions and from the evidence of the eclogues, could not have assumed its final shape till between the years 1314 and 1321—is, without comparison, the greatest epic of Christendom. It consists of one hundred cantos, of which the first may be regarded as introductory to the whole, so that thirty-three fall to each of the three *cantiche*—the *Inferno*, *Purgatorio*, and *Paradiso*. The poet feigns that in the holy week of the year 1300 he was privileged to pass through the realms of the other world, at the intercession of his Beatrice.

Each circle of Hell, each terrace of Purgatory, each heaven of Paradise, is peopled by spirits lost, expiating, or redeemed—the spirits of figures belonging to past history, to legend, or to the poet's own times, famous, notorious, or unknown, who discourse of themselves, of their age, of matters historical, ethical, scientific. Dante is the protagonist of the whole: whether speaking or listening, it is his figure that dominates the picture. His unfailing sense of justice, his tender love, his burning hate, no less than the absolute perfection of the form of the poem, caused posterity to add the word *divina* to the title its creator had himself given it. The metrical perfection is a marvel in itself.

There are a number of general introductions to the poet and his works. Scartazzini embodied most of his final views in the *Dante Handbuch*, translated into English by A. J. Butler (1893). Dean Church's brilliant *Essay* (1878); J. A. Symonds's *Introduction to the Study of Dante* (1899); Maria Francesca Rossetti's *A Shadow of Dante* (1871; 4th ed. 1884), and E. G. Gardner's admirable little *Dante Primer* (1900) should be mastered by all English students. See, too, A. J. Butler's *Dante, his Times and his Work* (1895), and Federn's *Dante and His*

Times (1902). Among recent foreign works are those of Klaus (*Dante, sein Leben und sein Werk*, etc., 1897), and Bassermann (*Dantes Spuren in Italien*, 1896). W. C. Lane has compiled a catalogue of the Harvard Dante Collection; and T. W. Koch, of the Cornell Collection (1898-1900). Paget Toynbee's *Dictionary of Dante* (1898) is well-nigh indispensable to the earnest student. See translations of the *Vita Nuova* by Rosseti (1874), and of the *Commedia* by Norton (1891-2) and Fletcher (1931).

Danton, George Jacques (1759-94), French revolutionist, was born at Arcis-sur-Aube, went to Paris in 1780, and in 1790 founded the Cordeliers' Club. He was attached to Mirabeau, and after his death attached himself to Marat and Robespierre, forming one of the revolutionary triumvirate. One of the organizers of the commune, though he had no share in the infamous September massacres, he justified them as inevitable excesses in the movement. He voted for the execution of the king (January, 1793), and was one of the original members of the Committee of Public Safety. In the Convention he was the leading member of the 'Mountain,' as the Paris party was called, and devoted his strength to the crushing of the Girondists. Danton strove hard to abate the excesses of the triumphant party of the Mountain, but only directed suspicion against himself. He became the object of the bitterest hatred to Robespierre, and in April, 1794, he, with Camille Desmoulins and others of his party, were brought before the revolutionary tribunal, condemned and executed (Apr. 5, 1794). Consult *Life*, in French, by Bougeart, and in English by Beesly; Gronlund's *Danton in the French Revolution* (1888); Carlyle's *French Revolution*.

Dantzig. See **Danzig**.

Danube, one of the most important rivers in Europe, second only to the Volga, has a total course of 1,725 m. through Germany, Austria, Hungary, and the Balkan States, with a drainage basin of some 153,000 sq.m. The river has its source in the union of two small streams rising in the Black Forest and uniting at Donaueschingen, 2,264 feet above sea level. It flows in a general northeasterly direction to Regensburg (Ratisbon), where it reaches its most northerly point, then turns to the southeast, and enters Upper Austria a little below Passau.

The Danube is connected with the Rhine

by means of the Ludwig Canal (1844); with the Elbe by means of the Moldau and Mühl, and by the Danube-Oder Canal, which connects with the Middle Elbe, and also with the river Vistula. The navigation of the Danube was declared free to all nations by the Treaty of Paris (1858), which provided for an International Danube Navigation Commission to be composed of delegates from all the Great Powers to take such steps as would render the river navigable. By the treaty of Versailles, which ended the World War in 1919, the Danube from Ulm was declared international territory, and the European Danube Commission reassumed its pre-war powers, but with representatives only from Great Britain, France, Italy and Roumania. A new international commission of two representatives of German riparian states, one representative of each other riparian state and one representative of each of the non-riparian states represented in the reconstituted Commission of the Danube, assumed control of the system where the competence of the European Commission ceases.

Danubian Principalities, a name formerly applied to Moldavia and Wallachia, now forming the kingdom of Roumania. Serbia and Bulgaria were sometimes also included under the term.

Danvers, town, Massachusetts, Essex co. Historic points of interest include Oak Knoll, the home of Whittier, the birthplace of Israel Putnam, the home of Rebecca Nurse (a victim of the Salem witchcraft), the Endicott Pear Tree, the Page House, and the Judge Holten House. Danvers was a part of Salem until 1757, and is memorable as the locality in which the witchcraft delusion first appeared, when ten inhabitants were sent to the gibbet; p. 14,179.

Danville, city, Illinois, county seat of Vermillion co. It is an important railroad junction, and has railroad shops, and one of the largest face brick plants in the country; p. 36,019.

Danville, city, Kentucky. It is the seat of Centre College for Men (Presbyterian), the Kentucky School for Deaf Mutes, and Kentucky College for Women (Presbyterian); p. 6,734.

Danville, borough, Pennsylvania. The Reading ironworks here is the oldest establishment in the United States for the manufacture of railroad iron, and has the distinction of having rolled the first iron 'T' rail, p. 7,122.

Danville, city, Virginia. It is the seat of Roanoke Institute (Bapt.), the Danville School for Boys, and Randolph-Macon Institute (Meth.). Danville succeeded Richmond as the capital of the Confederacy just before the close of the Civil War; p. 32,749.

D'Anville, Jean Baptiste Bourguignon (1697-1782), French geographer and map-maker. He published in all 211 maps; the most notable collections were the *Atlas Général* (1737-80), and the *Atlas Antiquus Major*, with its accompanying three volumes of *Geographie Ancienne* (1769).

the Treaty of Versailles Danzig, with its immediate environs, was established a free city under the protection of the League of Nations, which also appoints a High Commissioner. Subsequently treaties with Poland were negotiated providing for the inclusion of the city within the Polish customs frontiers, a free area to be maintained in the port. Poland was insured the free use of the city waterways, docks, etc., and the control and administration of the Vistula and of the railway system within the city, as well as of postal, telegraphic, and telephonic communi-



The Danube at Budapest.

Danzig, Baltic seaport, formerly a first-class fortress of Prussia and capital of the province of West Prussia, constituted a free city by the Peace Treaty of 1919. Danzig first appears in history in 997. About 1358 it joined the Hanseatic League, and soon became one of the most important mediæval commercial cities. In 1466 it placed itself as a 'free city' under the protection of the kings of Poland. Virtually independent, it developed rapidly in power and wealth, reaching the height of its prosperity toward the end of the sixteenth century. On the second partition of Poland, Danzig was awarded to Prussia (1793), and the prosperity of the city revived. It was besieged by the French in 1807, March to May, and by the Treaty of Tilsit was again created a free town, though under a French governor. The Allied Russians, Prussians, and English forced its surrender after a siege of eleven months in 1813, and in 1814 it was once more assigned to Prussia.

At the close of the Great War (1919), by

cations between Poland and Danzig. Thus, while the city remained predominantly German in population (only 6 per cent. Polish), economically and diplomatically it came under Polish control; p. 407,629.

Danzig became the ostensible cause of the European War, 1939. Adolf Hitler, from 1937-39, demanded the return of the free city to Ger., and the right to build a major highway across the Polish Corridor from Ger. to East Prussia. Poland refused both demands and on Sept. 1, 1939 Hitler sent his army into Danzig and Poland. Three days later England and France fulfilled their treaty obligations to Poland by declaring war on Germany and the Nazis seized Danzig. It was bombed 1942 by Brit. and Rus. bombers.

Daphne, in Greek mythology, a nymph, daughter of the river Peneus in Thessaly. When Apollo fell in love with her, and pursued her, she was changed by her mother, Earth, into a laurel.

Daphne, a genus of plants of the order Thymelacæ, consisting of a number of shrubs,

nearly all with handsome foliage and fragrant flowers. They are deciduous or evergreen, acrid and with poisonous berries. From a species of *Daphne* the so-called nepal paper is made.

Daphnia. See **Water Flea.**

Daphnis, a Sicilian shepherd, said to have been the inventor of bucolic poetry.

Daqahlia. See **Dakahlieh.**

Darbhanga, district and town, Bengal, India. The district has an area of 3,335 sq. m., forming a large alluvial plain, intersected by a network of streams and covered with

bridge of boats across in 480 B.C., and where, in 334 B.C. Alexander the Great crossed from Europe into Asia. This spot is also celebrated in romance by the exploits of Leander and later of Lord Byron. The strait is of great strategic importance as it commands the entrance to Constantinople from the Mediterranean. Both sides are strongly fortified, and the passage itself is extensively mined.

The military importance of the Dardanelles in the Great War, 1914-19 was tremendous. Allied possession of the channel would not only minimize the danger of German attacks



Danzig.

rice fields, bamboo, and mango-groves; p. 3,000,000. The town is 78 m. northeast of Patna by rail. It has large bazaars and a handsome market place, a hospital, and the maharajah's palace, with fine gardens, menagerie, and aviary; p. 66,000.

D'Arblay, Madame. See **Burney, Frances.**

Darboy, Georges (1813-71), archbishop of Paris, was born at Fayl-Billot, in Haute-Marne. At the Ecumenical Council of 1870 he strongly opposed the new dogmas, especially that of papal infallibility. He translated into French the works of Dionysius the Areopagite (1845), and wrote *Les Femmes de la Bible* (1846-9), and *Saint Thomas Becket* (1860).

Darbyites. See **Plymouth Brethren.**

Dardanelles, Hellespont, or Strait of Gallipoli, the long, narrow strait between Europe and Asia which connects the Sea of Marmora with the Ægean Sea. It is about forty-five miles long from northeast to southwest, and varies in width from one to five miles, being narrowest between Sestos and Abydos, the point at which Xerxes threw his

on Egypt and India and cut off the Asiatic Turks, but would open an all-year route for Russian grain to France and England and for arms and munitions back to Russia; while the much desired city of Constantinople would come under Allied protection. The Allies tried unsuccessfully to seize the Dardanelles. The losses of the campaign were heavy—115,000 men killed, wounded and missing and 100,000 more invalided. A commission was appointed by the British Parliament to investigate the failure, and its report, March, 1917, found Lord Kitchener, Winston Churchill, Lord Fisher, and Premier Asquith responsible. After the war the Dardanelles was opened to the Allies, and its forts were occupied by Allied troops. Full control was restored to Turkey in 1936 by the Treaty of Montreux. In 1939 Turkey agreed to use the strait to aid England and France against any power except Russia.

Dardania, a district of the Troad, adjoining the territory of Ilium. The Dardani, its inhabitants, were ruled by Æneas, and were closely allied with the Trojans.

Dardanus, son of Zeus and Electra, was

the mythical ancestor of the Trojans, and through them of the Romans.

Dardanus, also called **Dardanum** and **Dardanium**, a Greek city in the Troad. Here, in 84 B.C., peace was concluded between Mithridates, king of Pontus, and the Roman general Sulla. From it the name Dardanelles is derived.

Dardistan, a general geographical name for a number of small states or tribes on the southern slopes of the Karakoram and Hindu-Kush mountains. The Dards are an Aryan race, formerly Buddhists, but now Shi'ite Moslems, who speak a corrupt Sanskrit. Another name for them is Kanjut.

Dare. See **Dace**.

Dare, Virginia, the first child of English parents born in America. The child was born at Roanoke about one month after the settlement was made.

Dar-el-Beida, or **Casa Blanca**, principal seaport town of Morocco; p. 25,000.

Dares, a priest of Hephæstus at Troy, who, according to ancient authorities, wrote an Iliad older than that of Homer. The best editions are those of Dederich (1837), and Meister in the Teubner Series (1873).

Dar-es-Salam, city, formerly capital of German East Africa. During the World War (1914-19), it surrendered to a combined land and naval force under Allied command (Sept. 4, 1916); p. 50,000 native; 1,000 European.

Dar-Fertit, region of Central Sudan, s. of Darfur, north of 8°, a small part of it within the French and much of it within the English sphere of influence. A country of savannas it is thinly peopled by Niam-Niam.

Darfur, a region of Central Africa, long a center of the slave-trade, was annexed to Egypt in 1874-5. Since 1899 it has been recognized as part of the Egyptian Sudan and under British influence.

Dargai, a hill-village of British Baluchistan. On Oct. 20, 1897, the fortified heights adjoining, then strongly held by the Afridis and Orakzais, were carried by a magnificent charge of the Gordon Highlanders, the 2d Gurkhas, and the 3d Sikhs.

Dargomyzsky, Alexander Sergeivitch (1813-69), Russian composer and pianist, was born in Toula, and at 20 was a brilliant pianist. In 1847 he produced at Moscow his opera *Esmeralda*, which was written in 1839; in 1856 he brought out his best opera *Russalka*, in St. Petersburg; and in 1867 an opera-ballet *The Triumph of Bacchus*. From 1845 to 1855 he published over 100 minor works—songs

and ballads, which enjoy great popularity. His opera *The Stone Guest*, founded on Pushkin's version of Don Juan, was produced posthumously in 1872. He was, with Glinka, the founder of the Russian National School of Music.

Daric, ancient Persian coin named for Darius I., who is said to have been the first to coin it. It was made of gold, and its value was about five dollars.

Dariel, a magnificent gorge from 20 to 25 m. south of Vladikavkas, Caucasus, on the Georgian military road, through which the Terek rushes between granite cliffs rising above at a height of from 4,000 to 5,000 ft. The Dariel ravine is the Caucasian or Iberian Gates of classic authors. See **CAUCASUS**.

Darien. Gulf on the s. shore of the Caribbean Sea, in the angle between the coasts of Colombia and Panama. The name was formerly applied to the entire Isthmus of Panama.

Darien, town, Fairfield co., Connecticut. It lies close to the shore of Long Island Sound, and is a favorite summer resort; p. 9,222.

Darien Scheme, an unsuccessful scheme launched in 1695 by William Paterson, who founded the Bank of England, for establishing a commercial *entrepôt* and colony on the Isthmus of Darien, near Panama.

Darius, the name of several kings of the ancient Persian empire. **DARIUS I.**, the son of Hystaspes, who reigned from 521 to 485 B.C., was really the founder of the Persian empire. He succeeded Cambyses, introduced a new organization, divided the empire into twenty satrapies, exacting a fixed tribute.

Darjiling, or **Darjeeling**, town in district of same name, Bengal, India, is situated in the Himalayas, at over 7,000 ft. It has a fine sanatorium and a good water-supply, and is an increasingly popular summer-resort for visitors and invalids; p. 17,000.

Dark Ages. See **Middle Ages**.

Dark and Bloody Ground is a popular name for Kentucky, scene of Indian wars.

Darlan, Jean Francois (1881-1942), French admiral identified with the Vichy regime. When Gen. Eisenhower captured Algiers in Nov., 1942, Darlan ordered the French to cease fire and became civil administrator of French Africa. Was assassinated Dec. 24, 1942.

Darley, Felix Octavius Carr (1822-88), American artist and book-illustrator, born in Philadelphia, Pa. His illustrative work excelled in sharply-defined outline and freshness of design. Among his best pictures are *Cavalry Charge at Fredericksburg, Va.*, and *Street Scene in Rome*.

Darley, George (1795-1846), Irish poet, critic, and mathematician, was born in Dublin. His poems are mainly dramatic, and show the influence of the Elizabethan writers. His chief works include *Errors of Ecstasie* (1822), *Labors of Idleness* (1826), *Sylvia or the May Queen* (1827).

Darling, range of mountains, Western Australia, extending nearly 300 m. n. and s. along the w. coast.

Darling River, central river of Australia.

Darling, Grace Horsley (1815-42), was born in Bamborough, in Northumberland, daughter of a lighthouse-keeper on Longstone, one of the Farne Islands. On Sept. 7, 1838, she succeeded, along with her father, in rescuing the survivors of the *Forfarshire*, bound from Hull to Dundee.

Darlington, a parliamentary and municipal borough, Durham, England. The principal features are the church of St. Cuthbert, originally erected in the 12th century, Technical Institute, and Edward Pease Library, presented in 1885. In the Bank Top station Stephenson's No. 1 locomotive is preserved. The Darlington and Stockton Railway, opened in 1825, was the first public railway in the world on which steam locomotives were used; p. 65,866.

Darlington, James Henry (1856-1930), American Protestant Episcopal bishop, was born in Brooklyn, N. Y. Representing a Commission of the Episcopal Church, he obtained the approval of a Concordat with the Eastern Orthodox Churches and the Old Catholic prelates in Europe, and in July, 1920, was the first Western Bishop to be seated on the throne of the Ecumenical Patriarch in Constantinople. He edited *The Hymnal of the Church*, *In Memoriam*, and *Little Rhymes for Little People*, and wrote *Pastor and People* (1902).

Darlingtonia Californica, a pitcher plant, a member of the order Sarraceniacæ. It is insectivorous. In April it bears large white-and-green flowers.

Darmesteter, Arsene (1846-88), French philologist, brother of James Darmesteter, was born in Lorraine. Together with Hatzfeldt, he compiled an anthology of French 16th-century literature, which has become a standard work (1878).

Darmesteter, James (1849-94), French Orientalist, was born in Lorraine. His great work is his translation published (1880) in the *Sacred Books of the East*, of the whole of the *Zend Avesta*, except the Yacna and the Gâthâs.

Darmstadt, town, Germany, capital of Hesse-Darmstadt. The grand-ducal castle dates from the 15th, 16th, and 18th centuries, and shelters a large library, picture gallery, and museums. In the vicinity of the palace are a 16th-century town hall, polytechnic high school, and armory. Liebig the chemist was born here in 1803; p. 87,089.

Darnel Grass, a troublesome weed occurring in the grain fields of Europe, whence it has been introduced into the United States. The darnel is said to be the 'tares' of Scripture.

Darning Needle. See **Dragon Fly**.

Darnley, Henry Stewart, Lord (1545-67), Scottish noble, son of the Earl of Lennox, great-grandson of Henry VII., married Mary Queen of Scots in 1565. He was the father of James I. of England. See **MARY QUEEN OF SCOTS**.

Darrow, Clarence Seward (1857-1938), retired lawyer, born at Kinsman, O. He practiced law in Chicago, was connected with a large number of important cases, and was recognized as one of the leading criminal lawyers in the U. S. Among cases in which he appeared as counsel were the Debs Strike case, 1895; anthracite coal strike arbitration, 1902; Los Angeles Times dynamite case, 1911; atty. for Loeb and Leopold, 1924; atty. for Scopes evolution case, Dayton, Tenn., 1925; Fortescue-Massie case, Honolulu. Author of *Crime, Its Cause and Treatment* (1922), *The Story of My Life* (1932), and other works.

Darter, or **Snake-bird**, a name applied to the birds of the genus *Plotus*, near allies of the cormorant. The American Darter occurs in tropical and sub-tropical regions, and is of a glossy greenish-black color with silver-gray markings on certain of the wing feathers, and white hair-like feathers on the head. The neck is very long, the tail fan-like, with strong, stiff feathers.

Darter Fish, a small fresh-water fish of the perch family, abounding in pools and streams in the Central and Southern United States. It varies in length from 2 to 10 inches.

Dartford, market town, Kent, England. The first rolling and slitting mill for iron in England was built here in the 16th century. Wat Tyler's insurrection (1381) began at Dartford; p. 26,000.

Dartmoor, a plateau in the s.w. of Devon. England, about 22 m. long by about 20 broad, with a mean elevation of about 1,500 ft. Numerous granite-topped hills or 'tors' rise above the general level, the highest points being High Willhayse (2,040 ft.) and Yes Tor (2,030 ft.). The central part of the moor has formed,

since very early times, a royal 'forest' or reserve. The Dartmoor convict prison at Princetown was built originally for French prisoners of war in 1806. Consult Page's *Explanation of Dartmoor and its Antiquities*; and Baring-Gould's *Dartmoor*.

Dartmoor Massacre, the killing (April 6, 1815) of certain American prisoners-of-war who had been captured during the War of 1812 and confined in Dartmoor Prison, Devonshire, England, and who, the war being ended, apparently attempted to escape.



Clarence Darrow.

Dartmouth, municipal borough and seaport, South Devonshire, England. The town is of importance for its commerce and fisheries and as a yachting center. It is historically interesting as the port of embarkation of the Crusaders under Richard Coeur de Lion and for the old cadet training ship *Britannia* (now superseded by a Royal Naval College); p. 7,005.

Dartmouth College, an institution for higher education for men at Hanover, New Hampshire, developed from a school for the education of Indian youths, established by the Rev. Eleazar Wheelock in 1754 at Lebanon, Conn., and known as Moor's Indian Charity School. Funds for the maintenance of the school were received from private sources, from the general courts of Massachusetts Bay and New Hampshire and from England, where £10,000 was raised and placed in charge of a board of trustees headed by the Earl of Dartmouth. As a result of this endowment

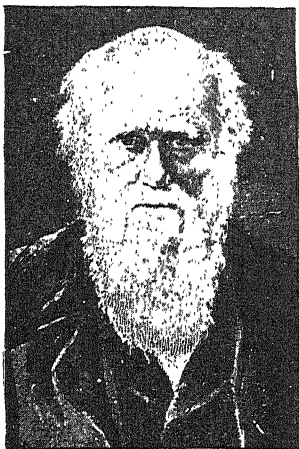
the institution was removed to its present situation, and chartered as a college in 1769, with Dr. Wheelock as its first president. Moor's school was made an independent institution. In 1816 the attempt to bring the college under the control of the State led to the famous suit in which Daniel Webster represented the trustees (see DARTMOUTH COLLEGE CASE).

Dartmouth College Case, an important case decided by the U. S. Supreme Court in 1819. Dartmouth College was chartered by George III. in 1769, the government of the institution being placed in the hands of twelve trustees. In 1816 William Woodward, secretary and treasurer of the corporation, was removed by the trustees, retaining in his possession certain property of the college; a controversy was thus precipitated, and, the legislature of New Hampshire, having revised the charter so as greatly to increase the number of trustees who were to be appointed by the State government, Woodward was reappointed by the new board. The old trustees refused to be bound by the act of the legislature, and brought suit again Woodward for the recovery of the college's property in his hands. The New Hampshire court gave judgment in favor of Woodward, and the case was then carried on a writ of error to the Supreme Court of the United States. The trustees were represented by Daniel Webster, who in a famous speech argued that the New Hampshire legislature had, in passing the act mentioned above, violated Art. i., § 10 of the Federal Constitution, which prohibits any State from passing any law impairing contracts. In this he was sustained by the court, which decided (1819) that any charter issued to a private corporation was essentially a contract, and could not subsequently be modified without consent of the corporation unless power to do so were expressly conferred in the charter. The decision was of extreme importance owing to its bearing on the law of corporations. See SUPREME COURT OF THE U. S.

Daru, Pierre Antoine Noël Bruno, Count (1767-1829), French administrator and historian, was born in Montpellier. A devoted follower of Napoleon, he was intendant-general in Austria and Prussia, a counselor of state, and for a time general administrator to the Grand Army. His most important publications are the *Histoire de la République de Venise* (1819); *Histoire de Bretagne* (1826).

Darwin, Charles Robert (1809-82), British naturalist, was born in Shrewsbury, his grandfather being Dr. Erasmus Darwin. His mother was the daughter of Josiah Wedg-

wood, the famous pottery manufacturer. In 1831 he was appointed naturalist to the *Beagle*, which made an expedition around the world. The voyage, which lasted five years, had a great influence on his future life. His most important book, *The Origin of Species*, was first published in 1859; many of his later works being merely elaborations along different lines of its main thesis. After *The Origin of Species*, probably his most famous book is *The Descent of Man* (1871), containing the speculations on the probable ancestor of man which for many years were regarded by the non-scientific world as Darwin's chief contri-



Charles Darwin.

(From the portrait by Hon. John Collier. By permission of the Linnean Society.)

bution to philosophical theory. This book also contained the supplementary theory of sexual selection, which has been much less widely accepted than that of natural selection. Other works are *The Variation of Plants and Animals under Domestication* (1868); *Insectivorous Plants* (1875); *Geological Observations on South America* (1846); *A Monograph on the Cirripedia* (1851-3).

Darwin was a man of attractive personality, charming manners, and kindly disposition. He was a voluminous collector of data on all subjects in which he was interested, all of which he utilized in experimentation. The centenary of his birth and the fiftieth anniversary of the publication of *The Origin of Species* was celebrated at Cambridge, Eng., on June 22, 1909, by delegates from many universities.

Darwin, Erasmus (1731-1802), English

physician and poet, grandfather of Charles Darwin. His direct influence on the work of his grandson was probably inconsiderable. His published works include *Zoonomia, or the Laws of Organic Life* (1794-96), *Phytologia, or Philosophy of Agriculture* (1799).

Darwin, Sir Francis (1848-1925), third son of Charles Darwin, was born in Down, Kent. He was his father's assistant until the death of the latter (1882) and was then appointed university lecturer and reader in botany at Cambridge (1884). His works include *Life and Letters of Charles Darwin* (1887); *Charles Darwin* (1892); *Elements of Botany* (1895).

Darwin, George Howard (1845-1912), second son of Charles Darwin, was born in Down, Kent. He was well known in the United States, where he lectured before universities and other learned bodies. His numerous scientific treatises include *A Paper on Periodic Orbits* (1896) and *The Tides and Kindred Phenomena in the Solar System* (1898).

Darwinism may be defined as the doctrine of natural selection, or the survival of the fittest, as put forward by Charles Darwin in *The Origin of Species* (first published in 1859). Popularly it is usually regarded as equivalent to the theory of evolution, often considered only in its application to one organism—man; but, as has been frequently pointed out, this view of Darwinism is entirely incorrect. Its novelty lay, not in the conception of evolution (a doctrine already familiar to philosophers), but in an exposition of a probable cause of evolution so clear and cogent as to remove the theory from the sphere of philosophical speculation to that of practical life.

The chief contents of *The Origin of Species* may briefly be summarized thus. The author collected and presented a large number of facts showing the variability of domesticated and of wild animals, and in the first case emphasized the fact that man, by artificial selection, has produced new forms—e.g. among pigeons—which differ from one another so markedly that, if they were wild birds, they would undoubtedly be placed by ornithologists in separate species or even genera. In other words man has, by artificial selection, produced new species. Can existing wild species be supposed to have arisen after a fashion at all analogous? Darwin answers this question in the affirmative, showing that organisms tend to increase faster than their means of subsistence; that necessarily there must ensue a struggle for existence; that in this struggle the fittest will survive; that a continuation of this

unconscious selecting process over successive generations will account for the characters of existing species. See Alfred Russel Wallace's *Darwinism* (1889); also critical expositions by T. H. Huxley, Asa Gray, J. G. Romanes, St. G. Mivart and E. D. Cope; and the other works of Darwin, especially *The Variation of Plants and Animals under Domestication* (1868); *The Descent of Man, and Selection in Relation to Sex* (1871); and *Life and Letters of Charles Darwin*, by Francis Darwin (3 vols., 1887).

Dasent, Sir George Webbe (1817-96), English Scandinavian scholar, born at St. Vincent, in the W. Indies. Called to the bar in 1852, he was for twenty-five years assistant-editor of the *Times*. He did much to familiarize British readers with Scandinavian and Icelandic literature. Among his works may be mentioned his translations of *The Prose or Younger Edda* (1842); *Popular Tales from the Norse*. In 1874 he assisted Vigfusson to complete Cleasby's *Icelandic-English Dictionary*.

Dashkoff, Ekaterina Romanovna, Princess (1743-1810), a Russian woman of learning. She travelled abroad, where she met Garrick, Robertson, Diderot, and Voltaire. On returning, she founded (1783) and became president of the Russian Academy, also director (1783-96) of the Russian Academy of Sciences, and superintended the production of a Russian dictionary.

Daskam, Josephine Dodge (Mrs. Sel-den Bacon) (1876), American author, was born at Stamford, Conn., and fitted there for Smith College, where she graduated in 1898. Her stories of life at Smith soon began to attract attention in the magazines, to which she also was a contributor of verse. Her books include *Smith College Stories* (1900), *The Imp and the Angel* (1901), *Middle Aged Love Stories* (1903), *Memories of a Baby* (1904) and *Poems* (1903).

Dass, Petter (1647-1708), Norwegian author, son of a Scotsman who had emigrated to Bergen. His best-known work is a poetic description of the diocese of Tromsø, called *Nordlands Trompet*.

Dasyures are small polyprotodont marsupials with a gray or brown coat spotted with white, a long tail thickly clothed with hair, narrow and pointed ears, and the general aspect of a civet. Most of the species live on the Australian continent or in Tasmania, where they take the place of the small carnivores found in other parts of the world.

Date and Date-Palm. Dates are the fruit

of a dioecious palm. De Candolle thinks that in times long before the earliest Egyptian dynasties the date-palm already existed wild, or was shown here and there by wandering tribes, in a narrow zone extending from the Euphrates to the Canaries, that its cultivation extended later, and that its area of distribution has remained very nearly the same for about 5,000 years, though it is now grown also in China and in California. Dates are the staple



Date-Palm.

food of the desert folk of Africa and Asia, either raw or dried, and are cooked in many ways. The date-palm can be grown in sandy, arid, alkaline soils, so long as it can reach water with its roots, even if this water be alkaline. The date-palm lives to a great age, and attains a height of from 90 to 100 ft. The flowers are borne in white or yellow spikes, and calyx and corolla consist each of three parts. The leaves are pinnate and terminal and are often used in connection with Palm Sunday. The fruits are borne in clusters of about 200, weighing from 20 to 30 pounds each.

Date Plum is a name given to certain trees belonging to the genus *Diospyros* of the Ebenaceæ. They bear yellow fruit, the pulp of which is edible and pleasant. For the allied American variety, the Virginian date plum, see *PERSIMMON*.

Datia, chief tn. of Datia state, Bundelkhand, Central India; p. 24,071.

Datis, a Mede, who commanded the expedition sent by Darius against Athens in 490 B.C., which captured Eretria, but was defeated at Marathon by the Athenians under Miltiades.

Datolite, a boro-silicate of lime, $\text{CaB}_2(\text{SiO}_4)_2$, which occurs in colorless or pale

greenish or yellowish crystals (sp. gr. 2.95) of the monoclinic system, and is found principally in cavities and fissures in weathered igneous rocks, such as diabase and serpentine.

Datum Line, the base-line of a section, or profile of the ground, when drawn on paper. Horizontal distances are marked along this, and vertical heights plotted normal to it, usually to a larger scale. The datum line represents a horizontal surface at some arbitrary height above a fixed 'datum' point—usually mean tide level.

Datura is a genus of herbs, trees, and shrubs belonging to the Solanaceæ. Many of its species produce brilliantly-colored trumpet-shaped flowers. All the daturas are easy of culture, in a light, moderately rich soil. The shrubby species are best treated as greenhouse plants, but the annuals may be grown as half-hardy. The most important annual species is *D. stramonium*, which produces in July white, long-tubed flowers, followed by the prickly fruit which gives the plant its popular name of 'thorn-apple'; *D. Tatula*, with purple stems and violet corollas, like the former, is a naturalized weed. Both are dangerous to children who eat the little black seeds, and they are known as 'jimson-weeds.'

Daub, Karl (1765-1836), German theologian. His chief works are *Judas Ischariot* (1816-18), an ingenious and profound discussion of the relations of good and evil, and *Die dogmatische Theologie jetziger Zeit* (1833).

Daubenton, Louis Jean Marie (1716-99), French naturalist, was born in Montbard in Burgundy. In 1742 he was asked by Buffon to contribute to the famous *Histoire Naturelle*, and wrote the anatomical part of it. He wrote much also for the first *Encyclopédie*.

D'Aubignac, François Hédelin, Abbé (1604-67), French author, born in Paris, owes his reputation to his *Pratique du Théâtre* (1657; Eng. trans. 1684), a long exposition of the 'dramatic rules' of Aristotle. Consult Arnaud's *Etude sur l'Abbé d'Aubignac*.

D'Aubigné, Jean Henri Merle (1794-1872), French theologian and ecclesiastical historian, was born in Eaux Vives, near Geneva. His greatest work, which in its day was very popular in Great Britain and the United States, is the *History of the Reformation in the 16th Century* (5 vols., 1835-53; Eng. trans. 1846-53). Consult *Life* by Bonnet.

D'Aubigné, Théodore Agrippa (1550-1630), French scholar and historian, was born in Saintonge. He was possessed of a spirit of biting satire, and his writings are frankly critical of the times. His principal work

L'Histoire Universelle, 1550-1601, produced between 1616 and 1620, was condemned to be burned by the hangman.

Daubigny, Charles François (1817-78), French landscape painter and etcher, closely allied with the Barbizon group, was born in Paris, a son of the painter Edward Daubigny. He visited England during the Franco-Prussian war, and made many sketches of the Thames. Daubigny is pre-eminently the painter of the river. He had a marvelous gift for composition and an intense love of nature. Among his most famous paintings are *Pond at Gylen*; *Lock in the Valley of Optevos*; and *Vintage*, in the Luxembourg; *Springtime*, generally considered his masterpiece. Consult Tryon's *Daubigny* in Van Dyke's *Modern French Masters*; Hoeber's *The Barbizon Painters*.

Daubigny, Karl Pierre (1848-86), French painter, son of Charles François Daubigny, was born in Paris. He studied and worked under his father and at first imitated him but later developed a style of his own. Among his works are *Return of the Fishing Fleet to Tourville*; *Sunrise in Normandy*; *Road from Paris to Fontainebleau*.

D'Aubusson. See **Aubusson, Pierre d'.**

Daucus. See **Carrot.**

Daudet, Alphonse (1840-97), French novelist and satirist, was born in Nîmes. His first work, a volume of poems, *Les Amoreuses*, was published in 1858; this was followed in 1863 by *Le Roman du Chaperon Rouge*, and in 1868 he produced *Le Petit Chose*, a work based on the trials of his early years. His other works include *Tartarin de Tarascon* (1872), a trenchant satire on the foibles of the inhabitants of Southern France, followed many years later by a second part, *Tartarin sur les Alpes*; *Jack*, a touching story of labor and Bohemia (1876); *Fromont Jeune et Risler Aîné* (1874), probably his best work, and one to which the French Academy awarded the Jouy prize; *Le Nabab* (1877), a study of Parisian manners, in which the private life of the Duc de Morny was minutely described; and *Sapho* (1884), recording the infatuation of a youth for an artist's model. In 1888 Daudet wrote *L'Immortel*, a severe satire on the French Academy, followed by *Trente Ans de Paris*, an autobiographical work; and *Souvenirs d'un Homme de Lettres* (1888), also of a personal character. Daudet takes rank as one of the ablest French novelists of the last quarter of the 19th century. He drew the life of his period with somewhat of the fidelity though not with the in-

tensity of Balzac. His *Œuvres Complètes* began to appear in 1899 and are to be had in English translation. Consult Jules Claretie's *Alphonse Daudet*; A. Gerstmann's *Leben von Alphonse Daudet*; R. H. Sherard's *A. Daudet*; L. M. Daudet's *Alphonse Daudet*.

Daudet, Ernest (1837-1921), an elder brother of Alphonse Daudet, acquired distinction both as a man of letters and as a prominent political writer associated with the republican party. His novels include *Cœur Blessé* (1900), *Poste Restante* (1902), and a biography, *Vie d'une Ambassadrice* (1903)—i.e. the Princess Lievan, the 'Princesse de Cadignan' of Balzac.



Alphonse Daudet.

Daudet, León (1867-1942), French novelist, son of Alphonse Daudet, was born in Paris, studied medicine, but devoted himself chiefly to literature. Among his works are *L'Astre noir*; *Les morticoles*, a satire upon doctors; *Suzanne*; *Alphonse Daudet*; *Souvenirs* (4 vols.).

Daugherty, Harry M. (1860-1941), American lawyer and cabinet official, was born in Washington Courthouse, Ohio. He moved to Columbus in 1893 and organized the law firm of Daugherty, Todd, and Rarey, of which he was senior member until his appointment, in 1921, as Attorney-General in President Harding's cabinet. Following the death of President Harding in August, 1923, he remained in the cabinet of President Coolidge, who asked for and received his resignation on March 28, 1924. Tried for conspiracy to defraud the government, he was acquitted in 1927.

Daughters of the American Revolution. See *Revolution, Daughters of the American.*

Daughters of the Confederacy. See *Confederacy, United Daughters of the.*
Daughters of the King. See *King, Daughters of the.*

Daughters of the Revolution. See *Revolution, Daughters of the.*

Dauin, pueblo, province of Negros Oriental, Philippines, on the southeast coast of the islands of Negros; 9 m. s. of Dumaguete. In the neighborhood are hot and sulphur springs remarkable for therapeutic qualities; p. 10,000.

D'Aulnoy, or D'Aunoy, Marie Catherine Jumelle de Berneville, Comtesse (1650-1705), French author remembered for her successful fairy stories (*Contes des Fées*, 1698) in the manner of Perrault, which have been translated and adapted for pantomimes.

D'Aumale. See *Aumale.*

Daumier, Honoré (1808-79), French caricaturist, was born in Marseilles. He joined the staff of *La Caricature*, and in 1832 was imprisoned in Ste. Pelagie for six months for his *Gargantua*, a caricature of Louis Philippe. When *La Caricature* was suppressed in 1835, Daumier devoted himself almost exclusively to *Le Charivari*, a new satiric paper. Among his most famous series of caricatures are *Les représentants représentés*; *Robert Macaire*; *Les Bohémiens de Paris*; *Les Actualitiés*; *Masques de 1831*. Consult *Alexandre's Life*; Holme's *Daumier and Gavarni*.

Daun, Leopold Joseph Maria, Count (1705-66), Austrian field-marshal, was born in Vienna. He won his chief fame during the Seven Years' War, where he was opposed to Frederick the Great. In 1757 he gained a great victory at Kolin, in 1758 at Hochkirch, and in 1759 at Maxen, where he captured Finck's army. He was (1751) founder and director of the Military Academy at Wiener-Neustadt. He was made field-marshal in 1754.

Dauphin, the title granted to the eldest son of the king of France, was originally that of the lords of Dauphine, whose crest was a *dolphin*; it was abolished after the revolution of 1830.

Dauphiné, former province of France, between the Alps on the e., the Rhone on the n. and w., and Provence on the s. It corresponds to the modern departments of Isère, Drôme, and Hautes-Alpes.

Dauphiné Alps, western portion of the Cottian Alps. The main mass is connected by the isthmus of the Col du Lautaret with the Col du Galibier, and is a vast snow-clad re-

gion, forming a horseshoe round the Vénéon valley.

Daurat, or Dorat, Jean (1507-88), called in Latin AURATUS, one of the seven poets who formed the Pléiade, a group including also Ronsard, Du Bellay, Baif, Jodelle, Pontus de Thyard and Belleau.

Davao, district, Mindanao, Philippines, occupying the southeastern part of the island, bordering on the Pacific Ocean and the Celebes Sea, and contiguous to the provinces of Surigao, Misamis and Cottabato. It has an area of 8,976 square miles; 25 islands with 195 square miles. The forest growths are of great value; there are indications of rich mineral deposits; p. civilized, 20,000; wild, 45,000; captured by Jap, 1941.

Davenant, Sir William (1606-68), English poet and dramatist, was, according to scandal, a natural son of 'Shakespeare.' He succeeded Ben Jonson as poet laureate in 1638, and was appointed governor of the king and queen's players at the Cockpit in London in 1639. Attempting a royalist mission to Virginia, he was captured, and was imprisoned in Cowes Castle and in the Tower (1650-2), and is said to have owed his life to the good offices of Milton. In prison he wrote his rather heavy epic of *Gondibert* (1651), upon which his reputation as a poet chiefly rests. Consult his *Collected Works* edited, with a memoir, by Laing and Maidment (5 vols.).

Davenport, city, Iowa, county seat of Scott co., is situated on the w. bank of the Mississippi River opposite Rock Island, Ill. It is the largest of the tri-city group of Davenport, Rock Island (Ill.), and Moline (Ill.). The Rock Island Arsenal, the government's largest manufacturing plant, is located on an island one thousand acres in extent, between Davenport and Rock Island. A magnificent government-owned bridge crosses the Mississippi here.

Davenport is located in a region rich in coal and agricultural products, which constitute the chief articles of commerce. Davenport was founded in 1836 by Antoine LeClaire and named for Colonel George Davenport, first white settler in the locality. It is sometimes known as 'The Gateway to the West,' by reason of the fact that the first bridge across the Mississippi was built here (1853) and the first railroad w. of the Mississippi started from this point. The locality is rich in history connected with the conflicts with the Indians; p. 66,039.

Davenport, Charles Benedict (1866-

1944), American zoölogist, born in Stamford, Conn. In 1898 he became director of the Cold Spring Harbor biological laboratory, and in 1904 director of the Station for Experimental Evolution of the Carnegie Institution at Cold Spring Harbor. Among his works are *Experimental Morphology* (1897-9); *Heredity in Relation to Eugenics* (1911); *Naval Officers--Their Development and Heredity* (1917). He is co-editor of the *Journal of Experimental Zoölogy of Genetics*, and other publications.

Davenport, Edward Loomis (1816-77), American actor, was born in Boston, Mass. He managed the Howard Athenæum at Boston from 1859 to 1869, and was for some time manager of the Chestnut Street Theatre at Philadelphia. His most noted impersonation was that of Brutus in *Julius Cæsar*.

Davenport, Fanny Lily Gipsy (1850-98), American actress, daughter of Edward L. Davenport and Fanny Vining (Davenport), an English actress, was born in London, England. While playing in Mrs. John Drew's company at the Arch Street Theatre, Philadelphia, she was engaged by Augustin Daly for his Fifth Avenue Theatre in New York, and was highly successful in a long list of leading parts including Mabel Renfrew in *Pique*, which ran for 250 nights.

Davenport, Homer Calvin (1867-1912), American cartoonist, was born in Silverton, Ore., and was brought up on a farm. He became connected with the San Francisco *Examiner*, and developed on that paper his skill in choosing salient characteristics of public men for exaggeration in his cartoons. He came to New York in 1895, on the purchase of the *Journal* (now *American*) by William Randolph Hearst, was afterward associated with that paper and still later with the *Mail*. He published *Davenport's Cartoons* (1898); *The Diary of a Country Boy* (1910); etc.

Davenport, John (1597-1670), American colonial divine, was born in Coventry, England. He was for a time vicar of St. Stephen's church in Coleman street, London, but resigned his living and in 1633 withdrew from the Church of England and retired to Holland. Having received through John Cotton a favorable impression of the Massachusetts Bay colony, he, with other refugees, sailed to Boston in 1637. He attended the synod of Cambridge in August, and in March of 1638 proceeded by boat with his company to Quinipiac and there founded the colony of New Haven on April 14. The constitution of

the new colony was definitely settled the following year, with seven 'pillars of state' as the governing body, of whom Davenport was one. He was called to Boston as pastor of the First Church in 1668, and was installed in the following year. His works include *Allegations of Scripture against the Baptising of some Kinds of Infants* (1634); and *A Discourse about Civil Government in a New Plantation* (1663).

David, the second, and by far the greatest, king of Israel, was born at Bethlehem in Judah, the youngest son of Jesse. By his subjugation of the Philistines and other hostile tribes, he raised Israel to the position of being the dominant power in Canaan. His reign began toward the close of the eleventh century B.C., and lasted for forty years. In early life David was a shepherd, and two accounts are given of his introduction to Saul, his predecessor. In one David is summoned to the court as a man of valor and a skilled musician and becomes the king's armor-bearer; but in the other account he is brought to Saul as a stripling, who volunteers to do battle against Goliath, the Philistine champion, gaining the royal favor by his success. He married Michal, Saul's daughter, and became the sworn friend of Jonathan, his son. With David's increasing popularity, Saul growing jealous of him, took steps to procure his death; and David, forced to seek refuge in flight, was an exile and an outlaw during Saul's later years.

On the death of Saul the tribe of Judah invited David to become their king, but it was not until seven years later that David became the uncontested sovereign of all Israel. The establishment of a new capital, Jerusalem, on Mt. Zion, a Jebusite fortress, was an all-important step in the amalgamation of the people. David made the city the religious center of the nation by bringing the ark thither. Then came David's wars of conquest against Ammon, Moab, Syria, and Edom, in all of which he was successful, thereby securing the kingdom against external foes. His later years were clouded by some sinister incidents: his sin with Bathsheba, and the murder of Uriah; Absalom's assassination of his half-brother Ammon, and his rebellion (in which David's crown and life were endangered), and death by the hand of Joab; and a further revolt under Sheba.

In estimating the character of David, it must be borne in mind that recent literary criticism of the Bible, even of a very conservative type, is disposed to question his

authorship of nearly all the psalms immemorably associated with his name. His sins were many, and sometimes of the blackest—yet, on the other side, he stands out as a truly heroic figure, and manifests many noble qualities. Consult Ewald's *History of Israel*; Kittel's *History of the Hebrews*; W. J. Deane's *David* (Men of the Bible Series).

David, or **Dewi** (d. 601?), the patron saint of Wales, said to have been born of royal parentage at Menevia (St. David's) and educated under Paulinus at York. He is credited with the foundation of monasteries at Glastonbury, Leominster, Bath, Repton, Raglan, and Crowland; and was consecrated to the archbishopric of Caerleon, which carried with it the primacy of Wales. He transferred his see from Caerleon to Menevia—thereafter styled St. David's. He was canonized by Pope Calixtus II. in 1121, and his day fixed for March 1.

David I. (1084-1153), king of Scotland, was the youngest son of Malcolm Canmore and Margaret (see MARGARET, SAINT), sister of Edgar the Atheling. He became prince of Cumbria in 1107, and further increased his power by his marriage with Matilda, Countess of Northampton (1110), becoming thereby an English baron. Having succeeded to the Scottish throne in 1124, he consolidated his realm, and, by the help of Norman knights, created the feudal kingdom of Scotland. The general aim of his domestic policy was to strengthen the Saxon and Norman elements, on whose support he relied. David took up arms on behalf of his niece Matilda in 1135, when Stephen mounted the English throne, and penetrated into England as far as Durham, where peace was made. He undertook a second invasion in 1138 and met with a disastrous defeat at Northallerton, in the Battle of the Standard, and again unsuccessfully invaded England in 1140. Consult Skene's *Celtic Scotland* and P. Hume Brown's *History of Scotland*.

David II. (1324-71), king of Scotland, succeeded his father, Robert Bruce, in 1329. After the English victory at Halidon Hill in 1333 he was sent to France (1334), where he remained till 1341. In 1346 he invaded England, but was disastrously defeated at Neville's Cross and taken prisoner.

David, Félicien César (1810-76), French musical composer, was born in Cadenet in Vaucluse. His 'symphonic ode' *Le Désert* (1844) achieved an instantaneous success. Other works followed, including an oratorio, *Moïse au Sinai* (1846); a symphony, *Christ-*

ophe Colomb (1847); a serious opera, *Herculeaneum*; three comic operas, *La Perle du Bresil* (1851), *Lalla Roukh* (1862), and *Le Saphir* (1865). David succeeded Berlioz as librarian of the conservatoire.

David, Ferdinand (1810-73), German violinist and musical composer, was born in Hamburg. He wrote many concertos and arrangements for the violin, and a valuable instruction book for the same instrument. Consult *Life*, in German, by Eckhardt.

David, Gerhard (c. 1450-1523), early Flemish painter, was born in Oudewater. entered the Painters' Guild in Bruges, and in 1501 became its dean. David was one of the foremost painters of the Early Netherlands School. His *Crucifixion* may be seen in the Metropolitan Museum, N. Y.

David, Jacques Louis (1748-1825), the painter of the French Revolution, was born in Paris. He acquired a reputation with his *Belisarius* (1781) and *Andromache Bewailing the Corpse of Hector*. During the Revolution, constituting himself dictator in French painting, sculpture, and decoration, he extinguished the frivolous and licentious art of the successors to Watteau. As court painter under Napoleon David painted his famous *Coronation* and *Distribution of the Eagles*. Banished at the Restoration to Brussels, he painted *The Three Fates* (1810), the greatest example of his vivid naturalism and artistic deftness. Consult *Le Peintre Louis David—Souvenirs et Documents Inédits*, by J. L. Jules David, and Stranahan's *History of French Painting*.

David, Laurent Olivier (1840-1926), Canadian writer and public official, was born in Sault-au-Récollet, Quebec. He was one of the founders and chief editor (1870-84) of *L'Opinion Publique* and one of the founders of *Le Bien Public* (1874), and of *La Tribune* (1880). His published works, which are notable for their beauty of style, include *Biographies et portraits* (1876); *Les patriotes de 1837-38* (1884); *Histoire du Canada depuis la Confédération*; *Gerbes Canadiennes* (1921).

David, Pierre Jean (1788-1856), called David of Angers, from his birthplace, French sculptor, was a pupil of Roland and of the painter David. His most celebrated works are the front of the Paris Panthéon, the tomb of General Gobert, the medallion portrait of Bonaparte, and the *Philopæmen* (Louvre), a nude study of unusual vigor. He also executed busts of Lafayette and Washington,

and a statue of Jefferson. Consult H. Jouin's *David d'Angers*.

Davids, Thomas William Rhys (1843-1922), English Orientalist, was born in Colchester. He is the author of *Ancient Coins and Measures of Ceylon* (1877); *Buddhist India* (1902); *Early Buddhism* (1908), etc. He contributed articles on Sanskrit and Pali to *Nelson's Loose-Leaf Encyclopædia*.

Davidson, Andrew Bruce (1831-1902), Scottish Semitic scholar, was born in Kirkhill in Aberdeenshire. He was appointed professor of Semitic languages and literature at the New College, Edinburgh, in 1863, and was a member of the Old Testament Revision Committee (1870).

Davidson, John (1857-1909), Scotch poet and playwright, was born in Renfrewshire, and in 1890 settled in London. In 1893 he published *Fleet Street Eclogues*, a remarkable set of impressions of London life, a second series of which appeared in 1896. The chief of his subsequent works were *Ballads and Songs* (1894); *Selected Poems* (1904). *The Man Forbid and Other Essays* was published posthumously (1910). Consult Archer's *Poets of the Younger Generation*.

Davidson, Lucretia Maria (1808-25), American poet, was born in Plattsburg, N. Y., daughter of Dr. Oliver Davidson. She is said to have begun to compose verses in her fifth year. Her sister, MARGARET MILLER DAVIDSON (1823-38), also began the writing of verse at an early age. The poems of the two sisters were edited by Washington Irving (1850).

Davidson, Samuel (1806-99), Irish Biblical scholar, was born in Kellswater, near Ballymena. Besides valuable works on the text and interpretation of Scripture, he published *Introductions* to the Old and New Testament. He was a member of the Old Testament Revision Committee.

Davidson College, a Presbyterian institution of learning founded in 1837 at Davidson, N. C. For latest statistics, see Table of American Colleges and Universities under UNIVERSITY.

Davies, Sir John (1569-1626), English poet and statesman, was born in Tisbury, Wiltshire. He was one of the founders of the Society of Antiquaries. His poetical works include *Orchestra, or a Poem of Dancing* (1596), *Nosce Teipsum* (1599), and *Hymns to Astræa*, a collection of clever acrostics (1599).

Davies, Sir Louis Henry (1845-1924), Canadian jurist, was born in Charlottetown,

Prince Edward Island. He was counsel for Great Britain in the International Fisheries Arbitration in 1877, a joint delegate with Sir Wilfrid Laurier to Washington in 1897, on the question of the Bering Sea seal fisheries, one of the joint High Commissioners on the part of Great Britain (1898) for the settlement of all differences with the United States in respect of Canada, and Minister of Marine and Fisheries for Canada from 1896 to 1901. He became Chief Justice of the Supreme Court of Canada in 1918, and Imperial Privy Councillor in 1919.

Davis, Samuel (1724-61), American clergyman, was born near Summit Ridge, Newcastle County, Del. He was president of the College of New Jersey, now Princeton, from 1759 until his death.

Davila, Enrico Caterino (1576-1631), Italian historian, was born near Padua. His *Historia delle guerre civili di Francia* is notable for its concise style and general accuracy.

Da Vinci. See **Leonardo da Vinci.**

Davis, Bette (1908-), American motion picture actress born at Lowell, Mass. At first she tried dancing, studying at the Mary Arden School in New Hampshire but gave this up for the theater. She went on the Broadway stage, but deserted it in 1930 for the screen. Some of her best performances have been in *Of Human Bondage*, *Border-town*, *Dangerous*, *The Petrified Forest*, *Jezebel*, *The Old Maid*, *The Private Lives of Elizabeth and Essex*, *Juárez*, *The Great Lie*, *The Letter*, *Dark Victory*, *The Man Who Came to Dinner*, and *The Little Foxes*. She won the award of the Motion Picture Academy of Arts and Sciences in 1935 (*Dangerous*) and 1938 (*Jezebel*).

Davis, Charles Harold (1856-1933), American painter, was born in Amesbury, Mass. His pictures include *Evening*, *August*, *The Brook*, and *Time of the Red-winged Blackbird*.

Davis, Charles Henry (1845-1921), American naval officer, was born in Cambridge, Mass. He was graduated from the U. S. Naval Academy in 1864, became rear admiral in 1904, and was retired in 1907. He is the author of *Telegraphic Determination of Longitude*; *Life of Rear Admiral Davis*, his father.

Davis, Cushman Kellogg (1838-1900), American political leader, was born in Henderson, N. Y. From 1887 until his death he was United States senator; did much to determine the policy of the United States at the time of the Spanish-American War. He

was one of the commissioners who negotiated the treaty of peace with Spain (1898).

Davis, David (1815-86), American jurist, was born in Cecil County, Md. In 1862, he became an associate justice of the U. S. Supreme Court, from which he resigned in 1877. He was a member of the U. S. Senate, 1877-1883.

Davis, Dwight Filley (1879-1945), American public official, born in St. Louis, Mo. He was a director of the War Finance Commission 1921-1923, acting Secretary (1923-5) and later Secretary of War in President Coolidge's cabinet and Gov. Gen. of the Philippine Islands (1929-1932).

Davis, Elmer (1890-), author, editor, journalist, radio news commentator, born Aurora, Ind. In 1942 he became Director of the new Office of War Information.

Davis, George Breckenridge (1847-1914), American soldier, born in Ware, Mass. He studied international law and represented the army at the Peace Congress at The Hague, 1907. His published works include *Elements of International Law* (1887); *The Second Peace Conference* (1907).

Davis, Harold Lenoir (1896-), author and winner of a Pulitzer Prize in 1936, was born at Youcalla, Oregon. He attended Stanford University, and in 1917 became a sheep and cattle herder, then a surveyor, county sheriff, and next, editor of the *Antelope* (Ore.) Herald. He served as a private in the World War. He won the Levinson Poetry Prize offered by Poetry magazine in 1919. In 1932 the Guggenheim Foundation sent him as a fellow to work in Mexico. His *Honey in the Horn* won the Harper prize in 1935, and received the Pulitzer award the following year. In 1936 and 1937 he was a contributor to *Collier's*, *American Mercury* and Poetry magazines.

Davis, Henry Gassaway (1823-1916), American capitalist, was born in Baltimore, Md. In 1865 he entered the West Virginia House of Delegates, was State senator from 1868 to 1871, and United States senator from 1871 to 1883. He was Democratic candidate for vice-president in the election of 1904.

Davis, Henry Winter (1817-65), American lawyer and political leader, was born in Annapolis, Maryland. As chairman of the 'Committee on the Rebellious States' in the House, he joined with Benjamin F. Wade, chairman of the corresponding committee in the Senate, in preparing what is known as the Wade-Davis Bill, the fundamental basis of which was that Congress alone had power to reconstruct the South. This bill was

passed by Congress (1864), but was 'killed' by 'pocket-veto' by President Lincoln. Davis and Wade thereupon issued the 'Wade-Davis Manifesto' denouncing the President. He published *The War of Ormuzd and Ahriman in the Nineteenth Century* (1853), an arraignment of slavery.

Davis, James John (1873-), American public official, was born in Tredegar, Wales. He was brought to America at the age of eight years. He early became interested in labor problems, and has held various offices in the Amalgamated Association of Iron, Steel, and Tin Workers. In 1921 he became Secretary of Labor in President Harding's Cabinet, was reappointed by Presidents Coolidge and Hoover. U. S. Senator from Pennsylvania for term 1933-9.

Davis, Jefferson (1808-89), American statesman, the President of the Confederate States, was born on June 3, 1808, in what is now the village of Fairview, Todd co., Kentucky. He was graduated from West Point in 1828, served in the Black Hawk War, and in 1835 resigned from the army. For several years he devoted himself assiduously to the raising of cotton and to study, but in 1843 began to take an active part in politics as a States Rights Democrat. In 1845 he was elected to the national House of Representatives, but resigned in June, 1846, to take part in the Mexican War, and as colonel of a Mississippi regiment served under General Taylor at Monterey and at Buena Vista, where he particularly distinguished himself and was severely wounded. From 1847 to 1851 he was a member of the U. S. Senate and was a conspicuous opponent of the Compromise Measures of 1850. From 1853 to 1857 he was an efficient Secretary of War in the Cabinet of President Pierce, and from 1857 to January, 1861, when he resigned, he was again a member of the Senate.

In the period immediately before the outbreak of the Civil War, Davis was preëminently the spokesman of the South. Himself a slaveholder, he defended slavery. Before the inauguration of President Lincoln he withdrew (Jan. 21, 1861) from the Senate, and soon afterward, on Feb. 8, 1861, was elected provisional President of the Confederate States. He was inaugurated on Feb. 18, was unanimously reëlected President under the permanent Confederate Constitution in November, 1861, and held office throughout the Civil War.

Though his high character and his devotion to the Confederacy were everywhere recog-

nized, his administration met with severe criticism almost from the beginning, and the general opinion of historians is that he was not equal to the demands which the great and devastating Civil War made upon him. A week before the surrender of General Lee he left Richmond, but on May 10, 1865, was captured by Federal troops near Irwinville, Ga. For two years thereafter he was confined as a prisoner at Fortress Monroe, awaiting trial for treason, but was released on bail in May, 1867, and the judicial proceedings against him were abandoned in February, 1869, by an order of *nolle prosequi*. In 1879 he retired to his estate at Beauvoir, near Biloxi, Miss., where he devoted himself to study and writing, and in 1881 published his *Rise and Fall of the Confederate States*, narrating the stirring events of 1861-5. Consult biographies by his second wife, by Pollard, by Alfried, and by Dodd.

Davis, or Davys, John (c. 1550-1605), English navigator. He was in charge of expeditions in search of a northwest passage to China and India. Davis was murdered by shipwrecked Japanese, whom he picked up off the coast of Penang. He published *The World's Hydrographical Description* and *The Seaman's Secrets*, and invented the back staff or Davis' quadrant.

Davis, John Chandler Bancroft (1822-1907), American lawyer and diplomat, was born in Worcester, Mass. He served as agent of the United States before the Geneva Court of Arbitration that settled the *Alabama* Claims in 1871-2.

Davis, John William (1873-), American diplomat, was born in Clarksburg, W. Va. He was elected to the 62d and 63d Congresses (1911-15), resigning to become Solicitor-General of the United States in 1913. From 1913 to 1918 he served as Counselor for the American Red Cross, and in the latter year was a member of the American delegation for conference with the Germans on the treatment and exchange of prisoners of war, at Berne, Switzerland. In 1918 he was appointed by President Wilson as Ambassador to Great Britain, a post which he resigned in April, 1921. In 1924 he was the Democratic nominee for the presidency of the United States. He was president of the American Bar Association in 1922-3.

Davis, Katharine Bement (1860-1935), American sociologist. She was Commissioner of Correction for New York City.

Davis, Matthew L. (1766-1850), American author, was born in New York City.

In politics he associated himself with Aaron Burr, and after the latter's death published his *Memoirs* (2 vols, 1836).

Davis, Nathan Smith (1817-1904), American physician, was born in Greene, N. Y. He was one of the founders of Northwestern University, the American Medical Association, the Chicago Academy of Sciences, the Chicago Historical Society.

Davis, Norman Hezekiah (1878-1944), American banker and diplomat, was born in Tennessee. Asst. Secretary of Treasury (1919-29); Acting Secretary of State (1920-1); head of American delegation to Geneva Disarmament Conference (1932); represented U. S. at Nine-Power-Treaty Conference (1937); National Chairman American Red Cross (1938-1944).

Davis, Richard Harding (1864-1916), American journalist, war correspondent and author. He was the son of L. Clarke Davis and Rebecca Harding Davis. He was born in Philadelphia, Penna. After working as a reporter on Philadelphia newspapers, in 1889 he joined the staff of the New York *Evening Sun*, where he attracted attention by his sketches of society life. He acted as war correspondent for the London *Times*, New York *Herald*, and New York *Tribune* in the Spanish, the Boer, and the Russo-Japanese Wars, the revolutions in Mexico, and the Great War of Europe. He was a prolific writer of fiction, plays, and stories embodying his experiences as a war correspondent. His first long story was *The Princess Aline*, published in 1895. His most popular novel, and the one he liked best, *Soldiers of Fortune*, appeared in 1899. Others of his long list are: *Gallagher and Other Stories* (1891); *Van Bibber and Others* (1892); *The Bar Sinister* (1904); *Kits and Outfits* (1905); *Somewhere in France* (1915). Plays produced by him are *Soldiers of Fortune*, *The Taming of Helen*, *Ransom's Folly*, *The Dictator*, *The Yankee Tourist*, and *Vera the Medium*.

Davis, Thomas Osborne (1814-45), Irish poet and patriot, was born at Mallow. In 1842 he founded the *Nation* (newspaper), and for its columns wrote stirring ballads and articles on historical and patriotic subjects, striving to unite all Irishmen. His *Poems* were published in 1846, and his *Literary and Historical Essays* in 1847.

Davis, Varina Anne Jefferson (1864-98), American author, was born in Richmond, Va. She was the youngest child of Jefferson Davis, and was affectionately called 'the Daughter of the Confederacy.'

Davis, William Morris (1850-1934), American geographer and geologist, was born in Philadelphia. From 1876 to 1885 he was instructor in geology and geography at Harvard, where he was subsequently assistant professor (1885-90) and professor (1890-99) of physical geography, and Sturgis-Hooper professor of geology (1899-1912). Professor Davis was founder and president of the Association of American Geographers and the Harvard Travellers Club. In addition to numerous essays he published: *Elementary Meteorology* (1894); *Physical Geography* (1898); *Practical Exercises in Physical Geography* (1908).

Davis, William Morris (1877-1930), American educator, was born in Amherst, Mass., professor of history at the University of Minnesota (from 1909). He published: *A Friend of Caesar* (1900); *God Wills It* (1901); *A Short History of the Near East* (1922); *Life on a Mediæval Barony* (1923); *The Beauty of the Purple* (1924); etc.

Davis Strait, the body of water between Greenland and Baffin Land. It extends north from the Atlantic Ocean, widening slightly into Baffin Bay, and is from 180 to 500 m. wide. Soundings of 5,500 ft., have been made. It was named for its discoverer, John Davis.

Davitt, Michael (1847-1906), Irish political agitator, was born near Straid, County Mayo. He was the organizer (1879) and active promoter of the Irish Land League, and in 1880 went to the United States to superintend the organization of the American Land League. On his return to England (1881) he was sent into penal servitude; and was again in prison for three months in 1883 for seditious speech. Davitt was a vigorous opponent of the land nationalization scheme of Charles Stewart Parnell, and took an active part in that leader's deposition in 1890. His published works include: *Leaves from a Prison Diary* (1884); *Fall of Feudalism in Ireland* (1904); *Pageant of London* (1905).

Davos, two villages (Platz and Dörfli) in the Swiss canton of the Grisons, alt. 5,115 ft. and 5,164 ft. respectively; p. of the two villages, 12,000.

Davout (incorrectly **Davoust**), **Louis Nicolas** (1770-1823), French marshal, was born at Annoux in Burgundy. He accompanied Bonaparte to the East, where he contributed to the victory at Aboukir; and on his return to France was appointed marshal of the empire (1804). He took a prominent part in the triumphs of Austerlitz and Auerstadt, and was created Duke of Auerstadt (1808).

For his services in the war with Austria in 1809, especially at Eckmühl and Wagram, he was made Prince of Eckmühl. As governor of Poland (1811) he ruled in a cruel and despotic manner. When Bonaparte escaped from Elba, he appointed Davout minister of war. After the Battle of Waterloo the latter received the command of the remnant of the French army under the walls of Paris, but concluded a military convention with the Allies.

Davy, Sir Humphry (1778-1829), English chemist, was born in Penzance, Cornwall. The discoveries on which Davy's fame as a chemist chiefly rest originated in the views which he developed in 1806 in his Bakerian lecture, *On Some Chemical Agencies of Electricity*, regarded as one of the most valuable contributions ever made to chemical science. He then discovered that the alkalies and earths are compound substances formed by oxygen united with metallic bases. In 1807 he succeeded in decomposing potash, forming the new metal potassium; he then decomposed soda and the alkaline earths, baryta, strontia, lime, and magnesia, and discovered the new metals, sodium, barium, strontium, calcium, and magnesium. He also investigated fire damp, producing in 1815 the miner's safety lamp which bears his name (see DAVY LAMP).

Davy Jones, a sailor's name for a malignant sea spirit or the devil generally. The common phrase 'Davy Jones' locker' is applied to the ocean as the grave of men drowned at sea.

Davy Lamp, a lamp consisting of oil enclosed in wire gauze so that, though the necessary air for combustion can get access to the flame, the lamp may be taken into an atmosphere liable to contain combustible gases without risk of causing an explosion. See SAFETY LAMPS.

Dawalla (*Hypophthalmus dawalla*), a fish found in the rivers of Guiana, and highly esteemed for the delicacy of its flesh. It is sometimes 2½ ft. long, and is brightly colored.

Dawbarn, Hugh Mackay (1849-1915), American surgeon, was born in Westchester County, N. Y. In 1887 he was appointed professor of surgery at the New York Polyclinic School. He later served as professor of surgery at the Fordham University Medical School, and senior surgeon of the New York Hospital. He performed many remarkable operations, including an extensive grafting operation from his own skin that saved his son's life (1908). In 1902 he was awarded the Gross Prize of the Philadelphia Academy of Medicine.

Dawes, Charles Gates (1865-), American public official, was born in Marietta, Ohio. In 1902 he organized the Central Trust Company of Illinois, became its president and chairman of the board, and was soon recognized as a dominant figure in the American financial world. On the entrance of America into the Great War, Dawes was commissioned major of engineers, was later purchasing agent for the American Expeditionary Force, and in 1918 became brigadier general. He organized and was first director (1921) of the U. S. Bureau of the Budget, and in 1923 was invited by the Reparations Committee in Paris to become chairman of the committee to investigate and report on a budget for the German government (see REPARATIONS). In 1924-28 he was vice-president of the United States. He was ambassador to Great Britain 1929-32. Later was president of the Reconstruction Finance Corporation. His published works include *Essays and Speeches* (1915); *A Journal of the Great War* (1922); *The First Year of the Budget of the United States* (1923).

Dawes, Henry Laurens (1816-1903), American political leader, was born in Cummington, Mass. He was a member of the National Congress (1857-75) and the U. S. Senate (1875-93). In the House he was long chairman of the Committee on Ways and Means, and in the Senate was identified with legislation concerning the Indians. In 1893-1903 he was chairman of the Commission to the Five Civilized Tribes of the Indian Territory.

Dawkins, Sir William Boyd (1838-1929), Welsh geologist, was born in Buttington, Welshpool. He became geologist to the Geological Survey of Great Britain in 1861, was curator of the Manchester Museum, 1870, and was elected professor of geology at Owens College, Manchester, in 1872.

Dawn, the morning twilight, is a diffused illumination caused by the reflection of the sun's rays from the higher atmospheric strata. It begins when the sun is 18° below the horizon, and terminates with its rising. The length of the interval depends upon the inclination to the horizon of the sun's diurnal path, and is accordingly least under the Equator, where, at the sea level, it does not exceed one hour, while in high latitudes it extends at midsummer from sunset to sunrise. See TWILIGHT.

Dawson, capital of Yukon Territory, Canada, is situated amid impressive scenery at the junction of the Klondike and Yukon Rivers; 360 miles northwest of Skagway, and 1,500 m

above the mouth of the Yukon. In winter the temperature sometimes falls to -50° F. or lower, in summer it may reach above 90° . Dawson was founded in 1896, when gold was discovered in the Klondike district, and is now the shipping center of the surrounding region; p. 3,000.

Dawson, Coningsby (William) (1883-), Anglo-American author, was born in High Wycombe, Buckinghamshire, England, and was graduated from Oxford (1905). He went to the United States in 1905, and in 1910-13 was literary adviser to the George H. Doran Publishing Co. He served throughout the Great War and afterwards lectured in many States on the results of the war. His published works include *The Worker and Other Poems* (1906); *The Garden Without Walls* (1913); *Out to Win* (1918); *The Vanishing Point* (1922); *When Father Christmas Was Late* (1929).

Dawson, George Mercer (1849-1901), Canadian geologist, son of Sir J. W. Dawson, was born in Pictou, Nova Scotia. He was geologist and naturalist to the North American Boundary Commission (1873-5), and later was connected with the Geological Survey of Canada. He became director of the Survey in 1895, a post which he held till his death. He rendered important services in the Bering Sea Dispute. He published *Descriptive Sketch of the Physical Geography and Geology of Canada* (1884); *The Physical and Geological Features of Part of the Rocky Mountains* (1885).

Dawson, Sir John William (1820-99), Canadian geologist and educator, was born in Pictou, Nova Scotia, and studied at the University of Edinburgh. He was professor of natural history and later vice-chancellor of McGill University, Montreal (1855-93). He was instrumental in founding the Royal Society of Canada, serving as its first president; and was president of the American Association for the Advancement of Science in 1882, and of the Geological Society of America in 1893. His *Devonian and Carboniferous Flora of Eastern North America* records the discovery of the Eozoön Canadianense of the Laurentian limestone (see Eozoön). He also published *Story of the Earth and Man* (1872); *The Meeting Place of Geology and History* (1894).

Dawson, Samuel Edward (1833-1916), Canadian publisher and author, was born in Halifax, N. S. He published *A Study of Lord Tennyson's Poem, The Princess* (1884); *Voyages of the Cabots in 1497 and 1498* (1894-7); *Canada and Newfoundland* (1897); *The St.*

Lawrence Basin and Its Border Lands (1905); *A Plea for Literature* (1908).

Dax (ancient *Aquæ Tarbellicæ*), town, France, in the department of Landes, on the Adour. It has a fourteenth century castle (now a barrack), and remains of Roman walls. Manufactures include liquor, faience ware, chronometers, and leather. Asphalt, rock salt, and iron ore are mined, and there are hot sulphur springs (116° - 140° F.) p. 11, 047.

Day, the interval of time during which the earth makes a complete rotation, consisting of twenty-four hours.

The sidereal day is the interval between successive passages of a star across the meridian. Each sidereal day is regarded as of the same length, and being the true period of the earth's rotation, is used by astronomers. The civil or solar day is measured between two meridian passages of the sun, and is about four minutes longer than the sidereal day. The length of the solar day is constantly varying by reason of the obliquity of the ecliptic and the varying speed of the earth's orbital motion; so, in order to get a fixed measure of solar time, astronomers imagine a sun moving uniformly in the celestial equator, and completing its circuit in the same time as the real sun. The time marked by this imaginary sun is called mean solar time.

The mean solar day is divided into twenty-four hours, the hours into minutes and seconds. A sidereal day, we have seen, is shorter; its exact length is 23 hours, 56 minutes, 4 seconds of mean solar or common time. In the course of a civil year of 365 days, the earth turns on its axis 366 times, or there are 366 sidereal days. Astronomers reckon the day as beginning at noon, and count the hours from 1 to 24. The civil day begins at midnight, and the hours are counted in two divisions of twelve each. The loss or gain of twenty-four hours in circumnavigating the globe is compensated by suppressing a day, according as the direction of travel is from the east or west, on reaching the 180th meridian from Greenwich.

Day, as opposed to night, varies with the latitude and the season of the year. As we go north from the equator it increases in summer, and decreases in winter. For the time of day in different countries, see TIME.

Day, as a legal term in the United States, denotes the period which elapses between one midnight and the next. But it may also mean only that part of the day during which business is transacted. Deeds, mortgages, etc.,

have precedence according to the order in which they were filed for record, and fractional days are of importance in the recording acts relating to real property.

Lawful day is a term sometimes applied to a day on which judicial business can competently be transacted. The opposite is generally known as *dies non juridicus*, or simply *dies non*, and includes Sundays and holidays.

Day, Clarence (1874-1935), American author born in New York, 1874. He was educated in St. Paul's School and Yale University (B. A. 1896, M. A. 1926). During the greater part of his adult life he was bed-ridden with arthritis. He kept up with his literary work, however, contributing extensively to periodicals. There is no evidence of his physical infirmity in his work, his humour being even and good natured. Books: *This Simian World* (1920); *Thoughts Without Words* (1926); *God and My Father* (1928); *Life With Father* (1932); *After All* (1936). He died December 28, 1935.

Day, David Talbot (1859-1925), American geologist, was born in East Rockport, O. He was chief of the Division of Mining and Mineral Resources, U. S. Geological Survey, from 1886 to 1907, and expert in charge of petroleum investigations (1907-14). In 1914 he became consulting chemist, U. S. Bureau of Mines.

Day, George Edward (1815-1905), American theologian and educator, was born in Pittsfield, Mass. He was editor of the *Theological Eclectic* from 1863 to 1871.

Day, Henry Noble (1809-1890), American clergyman and educator, was born in Washington, Conn. From 1858 to 1864 he was president of the Ohio Female College.

Day, Holman Francis (1865-1935), American author and dramatist, was born in Vassalboro, Me. His published works include: *Up in Maine* (verse, 1900); *Pine Tree Ballads* (1902); *Kin O'Ktaadn* (1904); *Squire Phin* (1905), dramatized as *The Circus Man*, 1909; *The Rider of the King Log* (1919).

Day, James Roscoe (1845-1923), American clergyman and educator, born in Whitneyville, Me. In 1894 he became chancellor of Syracuse University. He is the author of *The Raid on Prosperity* (1907) and *My Neighbor The Working Man* (1920).

Day, Jeremiah (1773-1867), American educator, was born in New Preston, Conn. He became president of Yale in 1817, resigning in 1846.

Day, John (1580-1640), English dramatist.

His *Isle of Gulls* was published in 1606. *Law Tricks and Humour out of Breath* in 1608, and *Parliament of Bees* in 1641.

Day, Stephen. See **Daye**.

Day, Thomas (1748-89), English author, was born in London. He was opposed to American negro slavery, and stated his views in *Reflections on the Present State of England and the Independence of America* (1762) and his poem, *The Dying Negro* (1773). He sympathized with the American patriots during the Revolutionary War, and wrote *The Devoted Legions* (1776) and *The Desolation of America* (1777). In 1783 appeared the first volume of his famous *History of Sandford and Merton*, the second and third following in 1786-9, the work being an apt adaptation of the *Emile* of Rousseau to English life.

Day, William A. (d. 1928), American lawyer and insurance official, was born in Wilmington, Del. Entering the service of the Equitable Life Assurance Society as auditor in 1905, in the following year he was elected vice-president, and in 1911 president.

Day, William Rufus (1849-1923), American jurist, was born in Ravenna, O. In 1897 he was appointed Assistant Secretary of State by President McKinley; and from April to September, 1898, served as Secretary of State, during the Spanish-American War. In 1903 he became an Associate Justice of the U. S. Supreme Court.

Dayaks. See **Dyaks**.

Day and Night Breezes, the name applied to the diurnal variations in the direction and velocity of the wind.

Daye, Stephen (1611-68), was born in London, England, and came over to Cambridge, Mass., to take charge of the printing press sent to the colonists by the Rev. Jesse Glover (1638). He was thus the first printer in the English colonies. He printed, first, *The Freeman's Oath*, then *An Almanack, Calculated for New England by Mr. Pierce, Mariner*, and his first book was *The Psalms in Metre*.

Day-fly. See **Ephemera**.

Daylight Saving, a name given to a movement for altering the clock at certain seasons of the year, so as to bring it more nearly into accord with solar time, and thus to obtain a greater utilization of natural light. Several plans have been suggested, the most widely advocated being to advance all time-pieces one hour in the spring and to set them back one hour in the autumn.

The scheme was introduced in Great Britain in 1907 by William Willet, whose persistent

advocacy of the system created wide-spread interest, and led to the introduction of a daylight saving bill in the House of Commons in 1908, and again in 1909, when it passed second reading, and was referred to a select committee, which rejected the chairman's draft report in its favor. The plan was revived after the outbreak of the European War as a means of national economy, and in the summer of 1916 was adopted by most of the countries of Europe, as well as by Nova Scotia.

Adherents of the daylight saving idea claim that it makes for an important saving in gas, electricity, and fuel, for the promotion of health, and for increased industrial efficiency. In the United States the Daylight Saving Act of 1918 was later repealed, but local ordinances provided for continuing the practice in many places. In 1942 it was made country-wide for the duration of the war.

Day Lily, a perennial herbaceous genus of Liliaceæ, so named from the ephemeral duration of its individual flowers. Several species are cultivated in flower gardens, especially the fragrant Yellow Day Lily.

Days of Grace are the extra days, usually three in number, allowed to a person liable under a bill of exchange or promissory note in which to make payment.

Dayton, city, Ohio. The city, finely situated in the fertile Miami Valley, covers an area of 17 sq. m. The streets are broad and regularly laid out, and there is a park system including 9 parks, having an area of 1,125 acres. Notable edifices are the old County Court House, designed after the Parthenon, the new County Court House, Federal Building, Memorial Hall. Just beyond the outskirts of the city is the National Military Home for Disabled Volunteers.

Dayton is the third city in the State in the importance of its manufactures. The National Cash Register Works, the Dayton-Wright and other airplane factories, and the Government Aviation Experimental Station are located in Dayton. The first settlement at Dayton was made in 1796, and in 1805 the town was incorporated and named in honor of Gen. Jonathan Dayton; p. 211, 456.

Daytona Beach, city, Volusia co., Florida. It is a well-known pleasure resort, with a good beach and many fine hotels; Daytona Beach is a combination of three cities, Daytona Beach, Daytona and Sea Breeze having been consolidated in 1925; p. 22, 584.

D.C. (*da capo*), a musical term signifying 'from the head or beginning.'

D.D.T., aculeto diphenyl trichloroethane, a spray for destroying injurious insects.

Deacon, an official in the Christian church. In Phil. 1:1 deacons are mentioned along with the bishops. The main duty of the deacons seems to have been the care of the poor. In modern churches there is great variety in the functions of the diaconate. In the Roman and Anglican communions, it is one of the three major orders of the clergy, but is in effect usually but a stage of probation for the priesthood. In Presbyterian churches the deacon is a layman, elected for the management of business, or of both spiritual and financial affairs, and his position and duties are similar in other Protestant churches.

Deaconess. Paul commends Phoebe to the church at Rome as a 'servant (*diakonos*) of the church that is at Cenchreæ,' and in the *Apostolic Constitutions*, 3d century, the deaconesses are a recognized order of female ministers. They co-operated with the deacons, showed the women their place in the church assemblies, assisted at the baptism of persons of their own sex, and arranged the *agapæ* or love-feasts. By the 7th century the Western Church discontinued the office, but in recent times it has been revived among the Reformed churches. Consult Potter's *Sisterhoods and Deaconesses*; Robinson's *Ministry of Deaconesses*; Golder's *History of the Deaconess Movement*.

Dead, Book of the, the funeral ritual of the Egyptians, describing in mystical language the experiences of the soul after death, and the text it must quote in order to escape the torments and trials of the lower world. Copies of the work, or portions of it, were buried with the mummy in his tomb. Such copies, hieroglyphic or hieratic according to the age when they were executed, constitute fully one-half of the thousands of extant papyri. The best edition is that of Naville, *Das Aegyptische Totenbuch* (1886).

Dead Centers, the two positions in which a crank is parallel to the force acting on it, and consequently has no turning moment on the shaft. To avoid this difficulty, when two cranks are employed, they are set at right angles, and when three, at 120° apart.

Dead Letter Office, a division of the U. S. Post Office for the reception of unclaimed or undeliverable mail matter.

Deadly Nightshade. See *Belladonna*.

Dead Nettle, the popular name of a labiate genus of plants which European country folk declare occasionally cause death by irritating the hands with stinging hairs, especially when

dried. The plants are inconspicuous, with purple or white flowers and nettle-like leaves.

Dead Sea, called by the Hebrews the Salt Sea and the Eastern Sea, by the classic writers the Sea of Asphalt, and by the Arabs the Bahr Lut, or Sea of Lot, is a large inland lake about 47 m. long and $9\frac{1}{2}$ miles wide, with a total area of 340 sq. m., in Southern Syria. It lies in a great tectonic fault caused by the general elevation of the region in the Eocene period, and is the lowest and the largest of the three lakes in the course of the Jordan. The south shore is low, level, and marshy, desolate and dreary. On this shore is the remarkable ridge of rock salt, 7 m. long and 300 ft. high, called *Khashm Usdom* ('Ridge of Sodom'). The water of the Dead Sea is characterized by the presence of a large quantity of magnesium and soda salts. The proportion of saline matter is so great that, while seawater contains only 3.5 per cent. of salts, the water of the Dead Sea contains upwards of 26 per cent., or nearly eight times as much as that of the ocean. The high specific gravity permits the human body to float easily on the surface of the water but the salinity is so great that no animal life is possible in the confines of the sea. See PALESTINE. Consult Lynch's *Narrative of the U. S. Expedition to the Dead Sea*; Smith's *Historical Geography of the Holy Land*.

Dead Sea Apple. See **Apple of Sodom**.

Dead's Part, in Scotch law, the portion of an estate remaining after the widow and children of the deceased had received the shares to which they were entitled by law. This remaining part was subject to the will of the testator.

Deaf Mutes, Education of. A deaf mute, commonly spoken of as deaf-and-dumb, is a person who, by reason of congenital or acquired deafness, is incapable of spontaneous speech. Spontaneous speech development takes place only as the individual can hear speech sounds, and, therefore, fails to occur where the power of hearing is absent. Deaf-mutism may be either congenital or acquired. Congenital deaf mutes are born with no potentiality for hearing, while the acquired condition is due to disease of the organs of hearing in early childhood before the development of speech (see DEAFNESS). In general, the term is applied to total deafness combined with entire lack of articulation, those who have become entirely deaf later in life and have retained the power of speech being known as semi-mutes. The first regular instructor of the deaf and dumb was Pedro

Ponce de Leon (1520-84), a Spanish monk, who taught several deaf mutes to speak, read, write and cipher. The first extant work on the education of the deaf was written by another monk, Juan Pablo Bonet, and was published in 1620 (English translation, 1890).

The famous school described by Pennant and Dr. Johnson (1773) was started in Edinburgh by Thomas Braidwood. The first English public school for the indigent deaf was established in 1792, in the Old Kent Road, London, the teacher being Dr. Joseph Watson, a nephew of Braidwood.

Meantime, Van Helmont of Brussels, and Amman, a Swiss living at Amsterdam, author of *Surdus Loquens* (1692), had experimented with the subject. Their method was adopted by Samuel Heinicke (1727-90), the founder of the first school for the deaf in Germany, and the first recognized by any government. Hence the method followed by this school of teachers is often spoken of as the 'German method.' To the Abbé de l'Épée of Paris (1712-89) must be given the credit of showing that the education of the deaf was a Christian duty. He elaborated the natural gestures of the deaf into a system of artificial signs, by means of which he was able to impart information to a large number of pupils at once. He was succeeded in his work by Sicard, and the system used by these teachers came to be known as the 'French method.'

The first regular school for the deaf was established in Hartford, Conn., in 1817, by the Rev. T. H. Gallaudet. In the meantime schools were being formed in other States. New York instituted her work in 1817, an asylum being chartered at New York City, of which, in 1831, Harvey P. Peet was made principal. He was succeeded by his son, Isaac L., in 1867. Under these teachers this institution has achieved great success. Its industrial features comprise a shoe-shop, tailor-shop, carpenter-shop, printing-office, garden, and sewing-rooms, the pupils being fitted for self-support by manual labor. There are two main types of schools, in addition to private schools, for the deaf: day schools, conducted as part of city school systems, and institutional schools. The National Government maintains the only institution in the world of collegiate rank for the deaf, at Washington. This is Gallaudet College, which, with The Kendall School, forms the Columbia Institution for the Deaf. There are three principal methods of instruction for the deaf—the manual, the oral, and the combined. In

the manual method, signs, the manual alphabet, and writing are the chief means of instruction employed. The sign language is essentially an ideographic and pantomimic language, practically all the signs being distinctly suggestive of the object or action which they denote. This sign language is supplemented by the manual alphabet, in which the letters are represented on the hand. The oral method of instruction depends upon speech and speech reading, and aims at facility in speaking and in reading the speech of others as well as at general development and use of the written language. All signs except purely natural signs are discarded. The pupils are taught to pronounce the elemental sounds of the language, singly and in combination, and to recognize their forms on the lips; to write, and to associate with these sounds and lip-movements the characters which represent them. The Clarke School, established in 1866 at Chelmsford, Mass., was the first oral school in the United States, other pioneers being the New York Institution for the Improved Instruction of Deaf Mutes, and the Horace Mann School of Boston. The oral method is now used in a number of institutional schools and is the prevailing method in day schools. A new method of teaching speech was introduced in 1848 by A. Melville Bell and introduced into America by his son Alexander Graham Bell. This system comprises 'a series of phonetic characters based on the position of the vocal organs when in action. The characters suggest to the eye the mechanism of speech in the formation of every possible sound that can be uttered.' (See *VISIBLE SPEECH*.) The combined method, as the name implies, is a combination of the manual and oral methods. In it mental development and the acquisition of language are made the primary aim, and speech and speech reading the secondary. This method is the predominant one in institutions in the United States, but is not used to any extent in day schools. The curriculum in schools for the deaf varies widely, the most common subjects being carpentry, sewing, printing, farming, shoe-making, and painting. After leaving school, the deaf mostly find employment in the ordinary handicrafts.

The blind deaf constitute a special class for educational purposes, as they can be taught through the sense of feeling only. The common method is by the use of the manual alphabet. Laura Bridgman and Helen Keller are two famous examples of the blind deaf who have thus acquired a liberal education.

Bibliography.—Consult Bell's *Deaf-Mute Instruction in Relation to the Work of the Public Schools*; Peet's *The Family Instruction of the Deaf in Early Childhood*; Gordon's *Notes and Observations on the Education of the Deaf*; *Bulletin*, 1919, No. 79, U. S. Bureau of Education, on *Schools for the Deaf*, 1917-18 (1920).

Deafness, or the loss of hearing, may be either congenital or acquired. Congenital deafness is due generally to lack of development or to destruction of the inner ear. Its primary cause is unknown, though heredity seems to play a rôle. Acquired deafness usually follows one of the acute infectious diseases. It occurs chiefly after scarlet fever and meningitis. It may be due, also, to primary disease of the auditory organs or to injuries of that portion of the brain lying between the auditory center and the ear. Temporary deafness may result from overdoses of certain drugs, from the accumulation of wax in the ear, or from sudden fright. Congenital deafness is incurable. Acquired deafness may be treated, but always by a physician. The best preventive measures against acquired deafness are due attention to primary ear troubles, treatment of adenoids and other diseases of the respiratory tract, and all measures directed to checking the spread of the acute infections.

Deák, Ferencz (1803-76), Hungarian statesman, was born in the county of Zala. In 1860 he rose to prominence, after Francis Joseph had been forced to promise to the Hungarians the restoration of their ancient rights. He was elected to the Diet of 1861, and became the leader of that body, as well as the foremost champion of national liberties. His firmness, eloquence, and wisdom brought about the compromise of 1867 which governed the relations between Austria and Hungary up to the time of the Great War (1914). Consult *Ferencz Deák, a Memoir*, with preface by Sir M. E. Grant-Duff, and Steinbach's *Franz Deák*.

Deakin, Alfred (1856-1919), Australian statesman, was born in Melbourne. As the representative of Victoria he visited England during the passage of the Commonwealth Act, and became attorney-general of the first Commonwealth ministry. In 1903 he succeeded Sir Edmund Barton as a premier, and held office until 1904. He was again premier in 1905-08 and 1909-10. In 1915 he was president of the Australian Commonwealth Commission to the San Francisco Exposition. He published *Irrigation in Western America*

(1885), *Irrigation in Egypt and Italy* (1887)

Deal, seaport and municipal borough, on the east coast of Kent, England Deal has mainly arisen to supply the wants of the numerous vessels which are often detained by the winds in the Downs. Deal has been one of the Cinque Ports since the 13th century. Of the three castles built by Henry VIII. in 1539, Deal Castle is the residence of its 'captain'; Walmer Castle is the residence of the Warden of the Cinque Ports; p 11,297.

Deal, a term applied to the wood of the yellow or Scotch fir and of the white or spruce fir.

Dealfish, one of the ribbon-fish which occur in the North Atlantic. It differs from the members of the other genera in the fact that the ventral fins are composed of several branched rays.

De Amicis, Edmondo. See **Amicis**.

Dean. A title variously applied, chiefly to ecclesiastical dignitaries. Among others can be mentioned the head (decanus) of ten monks in a monastery; the head of the chapter of canons of a cathedral or collegiate church; in German and American universities the professor who presides over each faculty.

Dean, Forest of, ancient royal forest in the west of Gloucestershire, England, between the Severn and the Wye. It is noted for its deposits of coal and iron.

Deane, Silas (1737-89), American diplomat, was born in Groton, Conn. With Benjamin Franklin and Arthur Lee he arranged political and commercial treaties with France, the documents being finally signed at Paris on Feb. 6, 1778. He also arranged for financial assistance from that country, and entered into expensive agreements with Lafayette, De Kalb and others for their personal services. In connection with these matters Deane published three brochures: *Paris Papers*, or *Mr. Silas Deane's late Intercepted Letters to his Brother and other Friends* (1781), *Letters to Hon. Robert Morris* (1784), and *An Address to the Free and Independent Citizens of the United States of North America* (1784). See *The Deane Papers* (1886-90).

Dean of Guild, formerly, in Scotland, the head of the merchant guild. His functions are now confined to the regulation of buildings within borough limits.

Dearborn, Henry (1751-1829), American soldier, was born in Northampton, N. H. He was secretary of war in the cabinet of President Jefferson (1801-9); became a major-general in January, 1812, and until his honorable discharge in June, 1815, was the senior

officer of the U. S. Army. At the outbreak of the War of 1812 he was placed in command of the northern department. He effected a partial conquest of Upper Canada, whose capital, York (now Toronto), he captured, (1813). In 1822-4 he was U. S. minister resident in Portugal.

Dearborn, Fort, a fort established by the U. S. Government on the site of Chicago, Ill., in 1804 and named in honor of Henry Dearborn, then secretary of war. It was evacuated by the small U. S. garrison (about 70) on Aug. 15, 1812, and was destroyed on the following day, the garrison being attacked soon after leaving the fort by Indians and about two-thirds of their number being killed. Consult Kirkland's *The Chicago Massacre of 1812*; Wentworth's *Early Chicago*, *Fort Dearborn*.

Death. It is one of the fundamental doctrines of physiology that every part of the organism has its own definite term of vitality, and that there is a continuous succession of the destruction of old cells and the formation of new ones in all tissues. Every blow we strike, every thought we think, is accompanied by the death and disintegration of a certain amount of muscular or nervous tissue as its necessary condition; and thus every action of our corporeal life takes place at the expense of the vitality of a certain amount of organized structure. This is termed molecular death, and, within its proper limits, is obviously essential to the life and well-being of the organisms. The cessation of the circulation and respiration may be regarded as constituting somatic death, or the death of the entire organism, which must obviously be shortly followed by the molecular death of every portion of the body. The first person to attempt a classification of the modes of human death was the great French physician Bichat. He based his classification on a metaphor, that since life rests on a tripod of heart, lungs and brain, death may follow the failure of any one of these supports and may consequently follow syncope, asphyxia, or coma. A better classification is as follows:

(1) Syncope. As brain and heart act together, there is in syncope a loss of consciousness and an impairment of the circulation. (2) Asthenia. This means literally death from want of strength. It is a common termination of old age and of fevers. Mistress Quickly's description of Sir John Falstaff's death (*Henry V*) is a wonderfully accurate clinical picture of asthenia. (3) Asphyxia or apnoea. The interference with breathing may be rap-

id, as in laryngeal disease, or slow and gradual, as in bronchial or pulmonary troubles. (4) Coma. This may result from direct injury to the brain, as in apoplexy, or from poisoning of the nervous centers, as in uræmic or opium poisoning. There is profound unconsciousness, the pupils being insensitive. The breathing is stertorous, and death is due to suffocation. While these four distinct modes of death are recognizable, the types are frequently combined. The ordinary signs of death are cessation of respiration and circulation, cooling of the body, cadaveric rigidity, and putrefaction. In cases of trance or suspended animation, however, the cardiac and respiratory action may be so feeble as to be imperceptible even to trained observers. The ultimate cause of death is the failure of the heart to function, causing a cessation of the circulation of the blood and consequent loss of nourishment to the tissues. This failure of the heart is brought about by so large a number of causes that it is impractical to attempt here to name them. Registration of death is a legal requirement in many countries. Following a death physicians are obliged to file a certificate giving its cause before permission to bury the body can be obtained. For disposal of the dead see BURIAL, BURIAL CUSTOMS, CREMATION, CEMETERY. See also VITAL STATISTICS.

Death, in its biological aspect, has been described as the penalty for having a body. In the Protozoa there is no distinction between the germ plasm (see HEREDITY) and soma or body; a protozoön reaches its limit of growth, and then divides to form two new individuals. It therefore follows that 'death as a natural recurrent phenomenon has no place among these organisms.' With the Metazoa it is otherwise: here the individual may be said in a large sense to exist only in order to hand on the deathless germ plasm to the new generation. In law a distinction is made between *natural* or physical death and *civil* death. Civil death is the extinction of civil rights following conviction of treason or of felony or banishment. In England civil death has been abolished and in its strictest sense it is not recognized in the United States. The law also considers as dead any person who has disappeared from his usual haunts for a period of seven years and about whom nothing can be discovered within that time. Hence a woman, after hearing nothing from or about her husband for such a period is legally free to remarry.

Death Rate. See VITAL STATISTICS.

Death's Head Moth, a large moth belonging to the sphinx family, Sphingidæ, which owes its name to the fact that the body bears a peculiar mark somewhat resembling a skull and crossbones. The caterpillar measures about four in., is brightly colored, and has a horn-like appendage near the tail. It is chiefly nocturnal in its habits and feeds upon the potato, deadly nightshade, and other plants. The adult moth has a dark plum-colored body striped with black, and soft and downy wings, the fore pair brown with yellow spots and markings, the hind pair yellow banded with black. A remarkable characteristic of this moth is its ability to produce a squeaking noise.

Death Valley or Amargosa Desert, an arid valley in California, about 100 m. long and from 10 to 20 m. wide. It includes the lowest point in the American continent, 276 ft. below sea level. The rainfall is slight, there is no vegetation in the valley bottom, and many travellers have perished there of thirst.

Death Watch, a name given to beetles belonging to the genus *Anobium*, living chiefly in old furniture and woodwork, to which they are often extremely destructive. They produce a curious ticking sound by hammering with the head against wood; this is presumably a sexual call, but is interpreted by the superstitious as a herald of death.

De Bary, Heinrich Anton (1831-88), German botanist and biologist, is chiefly known by his researches in connection with fungi, of the science of which (mycology) he may be styled the founder. His chief works are *Vergleichende Anatomie der Vegetationsorgane bei den Phanerogamen und Farnen* (1877); *Morphologie und Physiologie der Pilze, Flechten, und Myxomyceten* (1866); *Vorlesungen über Bakterien* (1885; Eng. trans. 1888).

Debates and Debating. A debate may be defined specifically as a setting forth of the pros and cons of a definite subject by two individuals or groups of individuals under certain fixed rules. Literature contains many examples of debates famous for oratory, lucidity, and eloquence. Among notable examples are the Douglas-Lincoln debates, the Webster-Hayne debate, and, in recent times, the Bryan-Darrow debate.

Debenture, a word of somewhat elastic meaning, but popularly understood to denote a form of security given by companies for money advanced to them on loan. Debentures are, however, sometimes issued by clubs,

and even by individuals. A debenture is usually, but not always, under seal; it acknowledges indebtedness on the part of the debtor, and contains a promise to repay the principal either at a specified date, or only on the happening of certain contingencies, with interest in the meantime.

Debi Patan, village, India, said to be the original centre of the Siva form of worship in North India. A religious fair attended by many thousands is held here every year.

Debit and Credit. See **Bookkeeping**.

Deborah, an Israelitish heroine of the period of the Judges. She joined Barak in a campaign to deliver Israel from the yoke of the Canaanites, and utterly routed the native confederation under Sisera. The narrative is given in two forms: the Song of Deborah which, if not by the heroine herself, is certainly of contemporary origin and therefore of great historical value; a prose version by a later writer, according to which Deborah was both a prophetess and a judge.

Debreczin, town and episcopal see, Hungary. It is the center of the Hungarian Protestants and has a theological (Calvinist) college, and an agricultural academy. In 1849 Debreczin was for some weeks the seat of the revolutionary government; and here, on March 15, 1849, Kossuth proclaimed the independence of Hungary; p. 103, 186.

Debruised, in heraldry. When an animal or other charge has one of the ordinaries laid over it, it is said to be *debruised* of that ordinary.

Debs, Eugene Victor (1855-1926), American labor organizer, was grand secretary and treasurer of the Brotherhood of Locomotive Firemen in 1880-93, and president of the American Railway Union, 1893-7. He conducted a successful strike on the Great Northern Railway, and was acquitted on a conspiracy charge, but was sent to jail for six months for contempt of court while conducting the great strike of the Western roads in 1894. He was the Social Democratic candidate for the presidency in 1900, and the Socialist candidate in 1904, 1908, and 1912, but declined nomination in 1916. In 1918, he was charged with a violation of the Espionage Act, was sentenced to ten years' imprisonment, and entered Leavenworth prison on April 13, 1919. While still in prison he was again nominated as presidential candidate by the Socialist Party. His sentence having been commuted by President Harding, he was released on Dec. 25, 1921. Debs commanded the respect of many who could not accept his

economic theories. See Reynolds' *Debs: His Life, Writings, and Speeches* (1908).

Debt, in the most general sense an obligation, whether present or future, which may be discharged by a money payment. In the strict common-law sense of the term, however, it is restricted to an obligation calling for the payment of a definite sum presently or at a definite time in the future or on demand. In certain cases, especially where the debt is one of record, modern statutes generally provide a process of a summary nature. Ultimately the creditor's claim is satisfied by execution against the debtor's estate. In the administration of the estates of bankrupts or decedents, debts due the state—taxes, excise duties, etc.—and debts of record are given preference over those due to private persons. The treatment of debt as a pecuniary obligation to be satisfied out of the estate of the debtor, and not as a breach of faith involving turpitude and punishment, is a result of the reorganization of society on a commercial basis. In the Roman law the insolvent debtor became the slave of his creditor. By the common law of England for several hundred years debtors were subject to imprisonment at the pleasure of their creditors, or until their debts should be discharged. The system of imprisonment for debt prevailed also in many of the United States. It was abolished in the latter country about 1831, but survived in England until 1868.

Debt, Public. Public indebtedness is a development of the last two centuries and has largely been the result of the establishment of constitutional forms of government, which can be held responsible for their financial obligations. The first great national debt was that of Great Britain, incurred with parliamentary sanction after the revolution of 1688. The national debt of the United States originated with the Revolutionary War. The adjustment of debts incurred during that conflict and the assumption by the Federal Government of the debts of the States made a total national debt in 1791 of \$75,463,000. The Civil War raised the national debt to \$2,773,236,000; and the World War swelled the total indebtedness of the United States, Federal, State and local, to over thirty billions. Public loans take a variety of forms, the most important of which are the following:

(1) Paper currency issued by the government. (2) Notes, treasury notes, treasury certificates, tax warrants, and a variety of short-term instruments. (3) Government

bonds running for longer periods and carrying ordinarily a promise or option of redemption (4) Annuities of various forms, providing for payment of annual interest for a long term of years or in perpetuity, but not for payment of the principal.

Except in time of war or great national emergency, much the same considerations govern the time of issue, type of security, rate of interest, dates of maturity, methods of marketing, and provision for repayments as in the case of large corporate borrowing. In earlier periods there was much discussion of the relative advantages of ultimate payment of the principal of public debts, on the one hand, and continuance of such debts in perpetuity, on the other. In the United States the national government has adopted a policy of ultimate redemption that has generally been imposed by the State constitutions on the State and local governments. The total gross public debt and guaranteed obligations of the U. S. Nov. 9, 1944, was \$212,198,989,123.

Most national debts have been incurred in connection with war; but with the development of credit and investment facilities in modern times there has been a tendency for governments, like private corporations, to utilize the advantages of credit in peacetime.

Consult Dewey's *Financial History of the United States*; Bass and Moulton's *America and the Balance Sheet of Europe* (1922); U. S. Census Report on *Wealth, Public Debt and Taxation*; 1922; Bullock's *Selected Readings in Public Finance* (3d ed. 1924); Jensen's *Problems of Public Finance* (1924); Lutz's *Public Finance* (1924); *A Critical Survey of State Debts* by the National Association of Mutual Savings Banks (1926).

Debussy, Claude Achille (1862-1918), French composer, was born in St.-Germain-en-Laye, and was educated at the Paris Conservatory, where his teachers were Massenet, Lavignac, Guiraud, and Marmontel. On April 30, 1902, his greatest work, *Pelléas et Mélisande*, was produced at the Opéra Comique, and its author was acclaimed the leader of the new French School. All the horror, grief, and mysticism of the text are reproduced by means of novel harmonies, unusual progressions, and ever-shifting tonalities. In 1904 appeared his symphonic poem *L'Après-midi d'un faune*, and in 1905 *La mer*, a series of symphonic sketches. Other important works are *Trois nocturnes*; *Ariettes oubliées*; *Petites suites*; the ballets *Jeux* and *Crimen Amoris*; incidental music to *King Lear*; besides in-

numerable songs and piano pieces. Consult F. Liebig's *Claude Achille Debussy*.

Deca (Greek, signifying ten), a prefix of frequent occurrence. *decalogue*, the Ten Commandments; *decade*, a collection or group of ten. In the calendar of the French Republic the term *decade* was used to designate the week of ten days.

Decachord, an ancient Greek instrument of ten strings (hence the name), triangular in shape; also a kind of large guitar with ten strings.

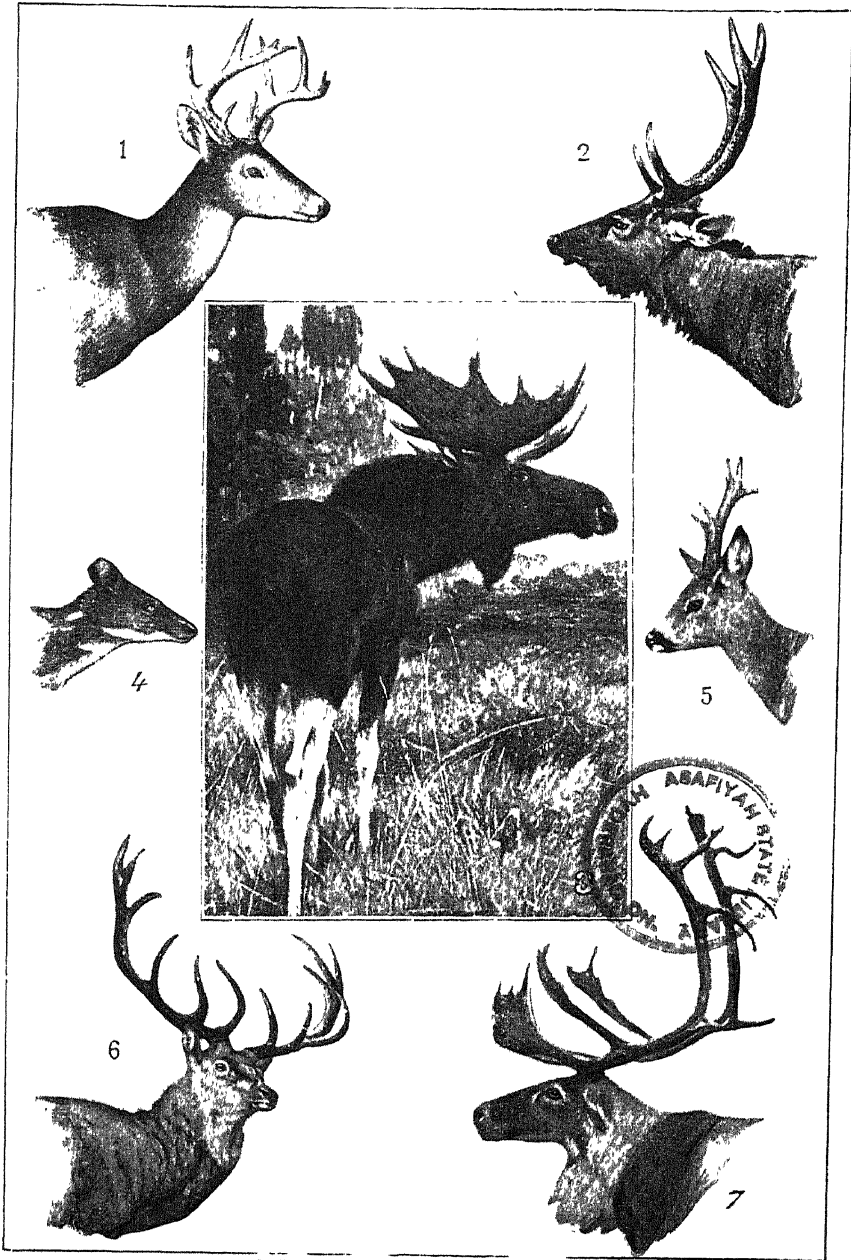
Décadents, a name given a section of young writers and artists, including Stéphane Mallarmé, Verlaine, Baudelaire, Maurice Barrès, Maeterlinck, and others in France during the late 19th century. Consult Symons' *The Symbolist Movement in Literature*.

Decagon, a term used in geometry to describe a plane figure having 10 angles and 10 sides. A *regular decagon* is one which has all the sides and angles equal.

Decalogue (Greek *dekalogos*, 'tenfold pronouncement'), the code of religious and moral precepts generally called the *Ten Commandments*. The churches are not at one in the enumeration of the 10 divisions of the Decalogue, there being no fewer than three divergent systems: (1) The Jewish, as in the Talmud; (2) the Roman Catholic and Lutheran; and (3) the Greek and Reformed. The Jews commonly considered the prefatory words in Exod. xx. 2 (Deut. v. 6), 'I am the Lord,' etc., as forming the first Word. The Lutheran Church, following another ancient Jewish division, divides the prohibition of evil concupiscence into two—the Ninth and Tenth Commandments, making 'Thou shalt not covet thy neighbor's house' (which in Exod. xx. 17 is mentioned first) the Ninth. The Roman Catholic Church, following Augustine, finds the Ninth Commandment in the first clause of Deut. v. 21, 'Thou shalt not covet thy neighbor's wife.' In the other Protestant Churches, and in the Greek Church, as also in Josephus, Philo, and the earliest Church Fathers, the prohibitions of other gods and of image worship are counted as the First and Second Commandments, and that of evil desire as *one*—the Tenth. Consult Dale's *Ten Commandments*; Bade's *The Decalogue: A Problem in Ethical Development* (1914).

Decameron. See **Boccaccio**.

De Camp, Joseph Rodéfer (1858-1923), American painter, was born in Cincinnati, Ohio. He is a member of the National Insti-



THE ANTLERED DEER

1. Virginian, or White-tailed Deer. 2. East Indian Sambar. 3. Moose; European Elk. 4. East Indian Jungle Deer. 5. Roe Deer. 6. Wapiti; American Elk. 7. Caribou; Reindeer. (All are stags.)

tute of Arts and Letters and of the Ten American Painters, and winner of numerous medals. Some of his paintings are: *Woman Drying Her Hair* (Cincinnati Museum); *Lady Playing a Guitar* (Boston Museum); *The New Gown* (Wilstach Gallery, Philadelphia).

Decamps, Alexandre-Gabriel (1803-60), French painter, was born in Paris. He exhibited his first pictures at the Salon—*Lapwing Hunting* and *A Soldier of the Vizier's Guard*, which attracted much favorable comment. Toward the end of 1827 he went to the Levant and soon afterward showed the first of the Oriental paintings for which he later became famous. His finest work is at Chantilly, and in the Wallace Collection, London. His *Night Watch at Smyrna* is in the Metropolitan Museum, New York.

De Candolle, Augustin Pyrame (1778-1841), Swiss botanist, was born in Geneva. De Candolle rendered great services in the domain of descriptive botany, especially in the natural classification of plants. The greatest of his works is *Regni Vegetabilis Systema Naturale* (1818-21), continued in the *Prodromus Systematis Naturalis Regni Vegetabilis* (1824-73). He bequeathed a herbarium of more than 70,000 species of plants to his son, Alphonse De Candolle.

Decapoda ('ten-legged'), the order of Crustacea to which belong crabs, lobsters, shrimps, and their allies, and which therefore include the highest crustaceans. The word is also applied to the sub-order of dibranchiate cuttles, to which the common squid belongs.

Decapolis, a region of 'ten (allied) cities' in Bashan, Gilead, and Syria, and including Bethshean (Scythopolis), in the Jordan valley. The various lists of Roman authors differ, but the ten cities included Damascus, Gerasa (Jerâsh in Gilead), Gadara, Hippos (Sûsieh, east of the Sea of Galilee), Pella (Fahil in the Jordan valley, east of the river), Philadelphia (Amman in Central Gilead), Scythopolis, Canatha (Kenath or Kanawât in East Bashan) with Capitoliâs (probably Beit er-Râs in North Gilead), Dion (Adun), and Raphana in Bashan.

De Cassagnac, Adolph Bernard Granier de. See **Cassagnac**.

Decathlon, an athletic contest consisting of ten events, each contestant participating in all of the events. See **OLYMPIC GAMES**.

Decatur, city, Illinois, county seat of Macon co. It is the seat of James Milliken University, the Pythian Home for the aged and orphans, and a fine Carnegie Library.

Lake Decatur, formed by the construction of a dam in the Sangamon River, provides a water supply. Decatur is an important shipping point, and an active railroad and industrial centre. The manufactures include iron foundry products, plumbing and electric light fixtures. Decatur was founded in 1830. During the period prior to the Civil War Abraham Lincoln practised law in a log cabin court house now standing in one of the city parks. He received his first endorsement as candidate for President at a Republican convention here in 1860. Here, on April 6, 1866, Dunham Post No. 1 of the G. A. R. was organized. Commission government was adopted in 1911; p. 59,305.

Decatur, Stephen (1779-1820), American naval officer, was born in Sinnepuxent, Md., the son of a naval officer who commanded a privateer during the American Revolution. He entered the U. S. Navy as a midshipman in 1798, and was commissioned lieutenant in the following year. During the Tripolitan War he commanded at different periods the *Argus*, *Enterprise*, *Intrepid*, *Constitution*, and *Congress*. On Feb. 16, 1804, at the head of a small party, he entered the harbor of Tripoli, boarded and burned the captured *Philadelphia*, and effected his escape under heavy fire. For this daring exploit Decatur was promoted to the rank of captain, then the highest regular rank in the Navy. In the War of 1812, as commander of the frigate *United States*, Decatur captured the British frigate *Macedonian*. With the courtesy rank of commodore he commanded a squadron of ten vessels in the Algerine War (1815), and negotiated on board his flagship, the *Guerrière*, a treaty of peace whereby the Dey of Algiers agreed that no tribute should ever be required by Algiers from the United States. He was killed in a duel by Commodore James Barron.

Deccan, or Dekkan (*Dakshin*, 'the south'), a term applied sometimes to the whole of the Indian peninsula south of the Vindhya Mountains, which separate it from the basin of the Ganges, and sometimes restricted to that portion of the same between the Rivers Nerbada and Kistna.

Deceit, in law, means fraudulently leading another to believe that which is not true, and thereby causing him legal injury or damage. There must have been false representations and reasonable reliance upon them. Intention to deceive is necessary, except in certain cases where statements made negligently and without due inquiry on the part of one whose

duty it is to know the truth have been held to be fraud and deceit. Concealment of material facts may amount to deceit.

DeCelles, Alfred Duclos (1843-1925), Canadian public official, was born in St. Laurent, Quebec. He was graduated from Laval University (1867), was admitted to the bar in 1873, and later turned to journalism, editing successively *Le Journal de Québec*, *La Minerve* (Montreal), and *L'Opinion Publique* (Montreal). In 1880 he became assistant librarian and in 1885 librarian of the Dominion Parliament. He is a chevalier of the Legion of Honor of France. Among many works he published: *Les Etats-Unis; Origine, Institutions, Développement* (1896), which received a prize from the Académie des Sciences, Morales, et Politiques of France; *Lafontaine et Son Temps* (1907); *L'Habitant; History of Colonization in Canada; Quebec Under Confederation*.

December, the last month of the year. In the old Roman calendar, before the time of Julius Caesar, the year began with March, and that which is now the 12th was then the 10th month; hence the same (*decem*, 'ten'). The early Saxons called it *Yule month*.

Decemviri, or Decemvirs, various commissions at Rome, of which the most important were the following:

(1) *Decemviri legibus scribendis* ('the decemvirs for writing the laws'). Their appointment (451 B.C.) was a success for the plebeians in their struggles against the patricians; for one of the plebeians' grievances was that the patricians alone were the custodians and administrators of the law. The plebeians secured the eligibility of their order to the office of decemvir, though no plebeian was actually elected then. At the end of their year of office the decemvirs published a code, which, after approval by the senate and assembly, was engraved on 10 tables of metal, and set up in the forum. The insurrection caused by Claudius' treatment of Virginia forced them to resign. Their laws, known as the *Laws of the Twelve Tables* (see TWELVE TABLES), formed the basis of all later Roman law. (2) *Decemviri stlitibus* (i.e., *litibus*) *indicandis* ('decemvirs for judging law suits'), a commission which had jurisdiction in civil cases during the republic. (3) *Decemviri sacris faciundis* ('decemvirs for the performance of sacred rites') was a college whose members were elected for life; their chief charge was the care of the Sibylline books, and the management of the games of Apollo and the secular games.

Deciduous Trees are those whose leaves fall in the autumn, in contradistinction to evergreen trees, which retain their leaves throughout the winter.

Decimal Fractions. Ordinary fractions, such as $\frac{3}{4}$, $\frac{12}{25}$, $\frac{121}{144}$, being difficult to add and subtract, etc., it was found advisable to change them, thus, $\frac{3}{4} = \frac{2}{10} + \frac{5}{100}$. Hence the number $967\frac{3}{4}$ can be read as $900 + 60 + 7 + \frac{2}{10} + \frac{5}{100}$. Each digit (in the fractional part as well as in the integral) has *ten* times the value of the like digit which immediately follows it. Writing that number thus, 967.25, the dot or 'decimal point' shows where the fraction begins.

Decimal System, the general title inclusive of all systems of weights, measures, and coinage, in which subdivisions and multiples proceed by powers of ten. The one objection to all decimal systems is that the number 10 is not divisible into thirds and quarters without the introduction of fractions.

Decimation, or the execution of every tenth man, a punishment devised by Roman military discipline when an offence had been committed by a large body of men which rendered them all liable to death, the selection being made by lot.

Decius, whose full name was **Gaius Messius Quintus Trajanus Decius**, emperor of Rome from 249 to 251 A.D. During his reign the Christians were persecuted severely, among the sufferers being Origen.

Decius Mus, Publius. (1.) Consul at Rome in 340 B.C. (2) Son of the above, was four times consul.

Declaration. Under the common law practice, the pleading containing, in proper form, a statement of the facts constituting the plaintiff's cause of action.

Declaration by United Nations. A joint declaration, signed Jan. 1, 1942, in which 26 nations affirmed the Atlantic Charter, pledged their resources for victory, and agreed not to make a separate peace. The nations signing the declaration were: the United States of America, the United Kingdom of Great Britain and Northern Ireland, the Union of Soviet Socialist Republics, China, Australia, Belgium, Canada, Costa Rica, Cuba, Czechoslovakia, Dominican Republic, El Salvador, Greece, Guatemala, Haiti, Honduras, India, Luxembourg, Netherlands, New Zealand, Nicaragua, Norway, Panama, Poland, South Africa, Yugoslavia.

Declaration in lieu of Oath. An unsworn statement before any person or body having judicial powers, by a witness, to the effect

that he will tell the whole truth and nothing but the truth in the testimony which he may be asked to give before them. By modern statutes an unbeliever, or one who has scruples against taking an oath, may solemnly declare or affirm that he will tell the truth instead. The legal effect is the same as an oath.

Declaration of Deceased Persons. Under certain circumstances the declarations or statements of deceased persons may be introduced in evidence at a trial. The admission of such testimony is an exception to the general rules of evidence that hearsay must be excluded, therefore such declarations must fall within well-established classes or they cannot be admitted.

Declaration of Independence, the document by which on July 4, 1776, the 13 American colonies declared their independence of Great Britain. At the outbreak of the Revolutionary War there seems to have been little popular sentiment in favor of independence, but gradually such a sentiment developed, and on June 7, 1776, Richard Henry Lee introduced in the Continental Congress the famous resolutions 'That these United Colonies are, and of right ought to be, free and independent states, that they are absolved from all allegiance to the British crown, and that all political connection between them and the state of Great Britain is, and ought to be, totally dissolved.' These resolutions, seconded by John Adams, were put aside for a time, and on June 10 a committee was appointed 'to prepare a declaration to the effect of the said first resolution.' The declaration, draughted by Jefferson, and slightly amended by Adams and Franklin, was presented to Congress on June 28. On July 2 Lee's resolutions, as given above, were passed, and on July 4, the declaration, substantially as draughted by Jefferson, was adopted. The text of the declaration is as follows:

The unanimous declaration of the thirteen United States of America. When in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitles them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal, that they are

endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed. That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness. Prudence, indeed, will dictate that Governments long established should not be changed for light and transient causes; and accordingly all experience hath shewn, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same Object, evinces a design to reduce them under absolute Despotism, it is their right, it is their duty, to throw off such Government, and to provide new Guards for their future security. Such has been the patient sufferance of these Colonies; and such is now the necessity which constrains them to alter their former Systems of Government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute Tyranny over these States. To prove this, let Facts be submitted to a candid world.

He has refused his Assent to Laws, the most wholesome and necessary for the public good.

He has forbidden his Governors to pass Laws of immediate and pressing importance, unless suspended in their operation till his Assent should be obtained; and when so suspended, he has utterly neglected to attend to them.

He has refused to pass other Laws for the accommodation of large districts of people, unless those people would relinquish the right of Representation in the Legislature, a right inestimable to them and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public Records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved Representative Houses repeatedly, for opposing with manly firmness

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He has dissolved Representative Houses repeatedly, for opposing with manly firmness



The Signing of the Declaration of Independence.
(Photographed from the Painting by John Trumbull.)

his invasions on the rights of the people.

He has refused for a long time, after such dissolutions, to cause others to be elected, whereby the Legislative powers, incapable of Annihilation, have returned to the People at large for their exercise; the State remaining in the meantime exposed to all the dangers of invasion from without, and convulsions within.

He has endeavored to prevent the population of these States; for that purpose obstructing the Laws for Naturalization of Foreigners; refusing to pass others to encourage their migrations hither, and raising the conditions of new Appropriations of Lands.

He has obstructed the Administration of Justice, by refusing his Assent to Laws for establishing Judiciary Powers.

He has made Judges dependent on his Will alone, for the tenure of their offices, and the amount and payment of their salaries.

He has erected a multitude of New Offices, and sent hither swarms of Officers to harass our people, and eat out their substance.

He has kept among us, in times of peace, Standing Armies without the Consent of our legislature.

He has affected to render the Military independent of and superior to the Civil power.

He has combined with others to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his Assent to their Acts of pretended Legislation:

For quartering large bodies of armed troops among us:

For protecting them, by a mock Trial, from punishment for any Murders which they should commit on the Inhabitants of these States:

For cutting off our Trade with all parts of the world:

For imposing Taxes on us without our Consent:

For depriving us in many cases, of the benefits of Trial by jury:

For transporting us beyond Seas to be tried for pretended offences:

For abolishing the free System of English Laws in a neighboring Province, establishing therein an Arbitrary government, and enlarging its Boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule into these Colonies:

For taking away our Charters, abolishing

our most valuable Laws, and altering fundamentally the Forms of our Governments:

For suspending our own Legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.

He has abdicated Government here, by declaring us out of his Protection and waging War against us.

He has plundered our seas, ravaged our Coasts, burnt our towns, and destroyed the lives of our people.

He is at this time transporting large Armies of foreign Mercenaries to compleat the works of death, desolation and tyranny, already begun with circumstances of Cruelty & perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the Head of a civilized nation.

He has constrained our fellow-Citizens taken captive on the high Seas to bear Arms against their Country, to become the executioners of their friends and Brethren, or to fall themselves by their Hands.

He has excited domestic insurrections amongst us, and has endeavored to bring on the inhabitants of our frontiers, the merciless Indian Savages, whose known rule of warfare, is an undistinguished destruction of all ages, sexes and conditions.

In every stage of these Oppressions We have Petitioned for Redress in the most humble terms: Our repeated Petitions have been answered only by repeated injury. A Prince, whose character is thus marked by every act which may define a Tyrant, is unfit to be the ruler of a free people.

Nor have We been wanting in attentions to our British brethren. We have warned them from time to time of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them by the ties of our common kindred to disavow these usurpations, which, would inevitably interrupt our connections and correspondence. They too have been deaf to the voice of justice and of consanguinity. We must, therefore, acquiesce in the necessity, which denounces our Separation, and hold them, as we hold the rest of mankind, Enemies in War, in Peace Friends.

WE, THEREFORE, the REPRESENTATIVES of the UNITED STATES OF AMERICA, in GENERAL CONGRESS, Assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the Name, and by

authority of the good People of these Colonies, solemnly PUBLISH and DECLARE, That these United Colonies are, and of Right ought to be FREE AND INDEPENDENT States; that they are Absolved from all Allegiance to the British Crown, and that all political connection between them and the State of Great Britain, is and ought to be totally dissolved; and that as FREE AND INDEPENDENT STATES, they have full Power to levy War, conclude Peace, contract Alliances, establish Commerce, and to do all other Acts and Things which INDEPENDENT STATES may of right do. And for the support of this Declaration, with a firm reliance on the protection of Divine Providence, We mutually pledge to each other our Lives, our Fortunes, and our sacred Honor.

The foregoing declaration was, by order of Congress, engrossed, and signed by the following members:

JOHN HANCOCK.

New Hampshire—Josiah Bartlett, Wm. Whipple, Matthew Thornton.

Massachusetts Bay—Saml. Adams, John Adams, Robt. Treat Paine, Elbridge Gerry.

Rhode Island, etc.—Step. Hopkins, Wm. Ellery.

Connecticut—Roger Sherman, Sam'l Huntington, Wm. Williams, Oliver Wolcott.

New York—Wm. Floyd, Phil. Livingston, Frans. Lewis, Lewis Morris.

New Jersey—Richd. Stockton, Jno. Witherspoon, Frans. Hopkinson, John Hart, Abra. Clark.

Pennsylvania—Robt. Morris, Benjamin Rush, Benja. Franklin, John Morton, Geo. Clymer, Jas. Smith, Geo. Taylor, James Wilson, Geo. Ross.

Delaware—Caesar Rodney, Geo. Read, Theo. M'Kean.

Maryland—Samuel Chase, Wm. Paca, Thos. Stone, Charles Carroll of Carrollton.

Virginia—George Wythe, Richard Henry Lee, Th. Jefferson, Benja. Harrison, Thos. Nelson, Jr, Francis Lightfoot Lee, Carter Braxton.

North Carolina—Wm. Hooper, Joseph Hewes, John Penn.

South Carolina—Edward Rutledge, Thos. Heyward, junr., Thomas Lynch, junr., Arthur Middleton.

Georgia—Button Gwinnett, Lyman Hall, Geo. Walton.

Bibliography—Consult Friedenwald, *The Declaration of Independence: an Interpretation and an Analysis* (1904); Hazelton, *The*

Declaration of Independence (1906); Chamberlain, 'The Authentication of the Declaration' in *John Adams and Other Essays and Addresses* (1898); and Tyler, *Literary History of the American Revolution* (2 vols, 1897). The best collection of biographies of the signers is still Sanderson's *Biography of the Signers of the Declaration of Independence* (9 vols., 1823-7).

Declaration of Paris. With the object of introducing uniformity into the usages of maritime warfare, the plenipotentiaries of the various powers who were parties to the Treaty of Paris of 1856, after the Crimean War, agreed on the following articles, known as the Declaration of Paris:—(1) Privateering is, and remains, abolished; (2) the neutral flag covers enemy's goods, with the exception of contraband of war; (3) neutral goods, with the exception of contraband of war, are not liable to capture under the enemy's flag, (4) blockades, in order to be binding, must be effective—i.e. maintained by a force sufficient really to prevent access to the coast of the enemy. The declaration was not acceded to by the United States or Venezuela, nor as to the first clause by Spain or Mexico; but in 1898, on the outbreak of war between Spain and the United States, both belligerents bound themselves by the full terms of the declaration.

Declaration of Rights. See **Bill of Rights**.

Declarator. In the law of Scotland, an action in which the plaintiff asks the court to declare the existence of some right of his about which there is a doubt. This form of action has never existed in the United States.

Declaratory Act, an act passed by Parliament and on Mar. 18, 1766, signed by George III., accompanying the repeal of the Stamp Act and declaring that the American colonies 'have been, are, and of right ought to be, subordinate unto, and dependent upon the imperial crown and parliament of Great Britain.' As Lord Shelburne afterwards wrote to Pitt, the effect of the act was to keep alive 'an unfortunate jealousy and distrust of the English government throughout the colonies.'

Decle, Lionel (1859), Anglo-French journalist and explorer, conducted the *Daily Telegraph* expedition from the Cape to Cairo. He has published *Three Years in Savage Africa* (1898); and *Trooper 3809* (1899), a realistic picture of a French conscript's life.

Declension, the term employed by grammarians to denote the changes in the structure of certain classes of words (generally the

noun, adjective, pronoun, and article) to express different relationships with other words.

Declination, in astronomy, is the angular distance of a heavenly body n. or s. of the celestial equator.

Declination Needle, or **Declinometer**, an instrument for registering the amount and variations of magnetic declination. Through the adoption of Charles Brooke's photographic method, it was made self-recording in 1848, when a drum covered with sensitized paper, and caused to revolve once in twenty-four hours, was placed so as to receive a spot of light reflected from a small mirror attached to the needle. A zigzagged curve denotes the occurrence of vibrations, measurable in time and extent, and significant of changes in magnetic declination.

Decoration Day, or **Memorial Day**, a day set apart (as a legal holiday) in many of the states of the American Union for the purpose of commemorating the soldiers who fell in the Civil War and decorating their graves. The day thus set apart is May 30. In some Southern States there is a separate day, devoted to commemoration of the Confederate soldiers who fell in the war.

De Costa, Benjamin Franklin (1831-1902), American clergyman, was born in Charlestown, Mass. He removed to New York, where he was rector of the Church of St. John the Evangelist from 1863 to 1899. In the latter year he joined the Roman Catholic Church. Dr. De Costa founded the White Cross Society in 1884. He was also active in organizing the Church Temperance Society. He became an authority in American history, publishing among other works, *The Pre-Columbian Discovery of America by the Northmen* (1868), *Columbus and the Geographers of the North* (1872).

Decoy. Means of attracting game within range of a hunter's weapons have been used, no doubt, ever since hunting began, and in the greatest practicable variety. Decoys fall into two classes—living and inanimate. Living decoys may be trained to the work, or simply exhibited, and expected to do nothing of their own will to aid the sportsman. Such are the stool-pigeons which formerly, with their eyes stitched up, were placed on sticks over a trap-net spread on the ground, and then made to flutter by the fowler who shook the perch by means of a cord from his place of concealment. Sometimes the decoy animals are taught to do their duty intelligently. Dogs have been so trained in some parts of the world; and along the N. American coast

many men who make a business of shooting wild fowl have ducks which know how to go out toward a passing flock of free birds and toll them in where the man is waiting to shoot, the decoy birds dropping out of harm's way at the last moment.

While trained decoys are largely used in the United States as elsewhere, sportsmen more generally content themselves with images of the birds they are after. In some cases, stuffed specimens are used, but ordinarily they are images carved from wood or made of hollow metal, and painted to represent various species of water fowl or shore birds.

Decree, the decision or determination of the rights of the parties to an action or proceeding in courts. A decree of a court of equity may be either interlocutory or final. It is said to be interlocutory when it merely disposes of a part of the matters at issue, or leaves something more than the mere ministerial execution of the court's orders to be done. For example, an interlocutory decree may be entered in a divorce action, granting the divorce, and leaving open the question of custody of children, or alimony, which matters would be disposed of in a final decree. It is final when it includes a complete determination of the matter in controversy upon all the facts.

Decrescent, **Decrement**, **Decours**, in heraldry, terms applied to the figure of the *waning* moon—i.e. with its horns turned to the sinister.

Dedham, tn., Mass., county seat of Norfolk co. Principally a residential suburb, it contains the oldest frame house in America, the Fairbanks house (1636) and a courthouse. Settled in 1636 Dedham was then called Contentment; p. 15,508.

Deduction, in logic and reasoning, is commonly described as the process of inference in which we pass from general principles to particular conclusions or consequences, and is thus contrasted with induction, in which we pass from particular data to the general principle that underlies them.

Dee. (1.) River of England and Wales, 80 m. long, rises in Merionethshire, and flows, generally n., into the Irish Sea. It almost encircles the city of Chester. The ancient Britons held its waters sacred. (2.) River, Aberdeenshire and Kincardineshire, Scotland, rises in the Cairngorm Mts., Aberdeenshire, and falls into the North Sea at Aberdeen. It is one of the finest salmon rivers in Britain.

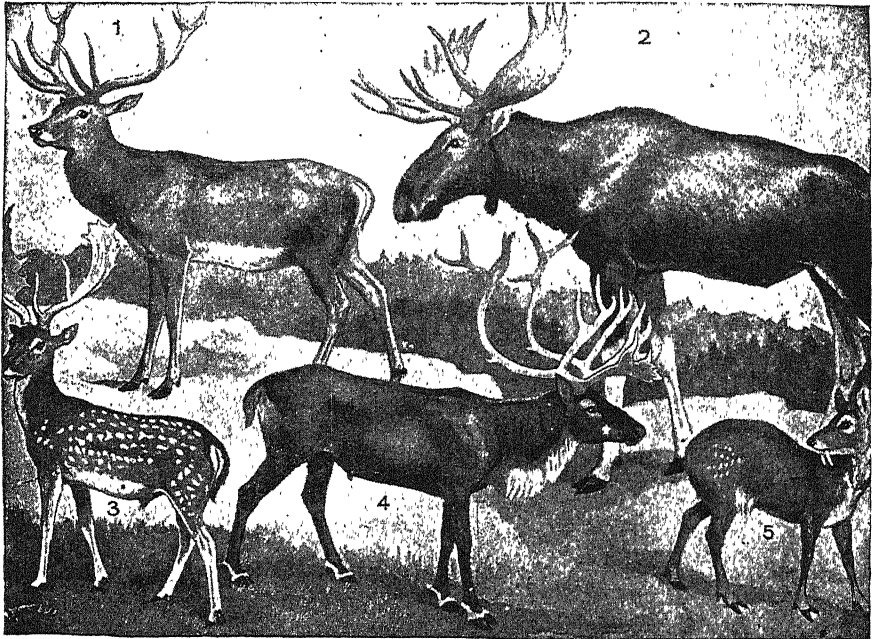
Dee, John (1527-1608), English alchemist and astrologer, born in London; became

known as a sorcerer after a representation of Aristophanes's *Peace*, wherein he used a mechanical beetle Imprisoned (1555) under Queen Mary, he became (1586) head of a small confraternity for seeking the philosopher's stone and invoking the angels, and in 1595 he was made warden of Manchester College. See his own *Private Diary*, ed. Halliwell-Phillipps (1842); and Mackay's *Memoirs of Extraordinary Popular Delusions*.

Deed. In law, an instrument in writing under seal, binding by its terms one or more

British novelist, author of narrative novels, including *Sorrell and Son* (1925); *Love Among the Ruins*; *Exiles* (1930); *Fox Farm*; *The House of Adventure*; *Old Wine and New* (1932); and *Dark Horse* (1941).

Deer, generally all the members of the family Cervidæ. As thus defined deer are artiodactyle ungulates ('even-toed hoofed animals'), distinguished by the fact that, with very few exceptions, the head—in the male sex alone, except reindeer—bears branched deciduous antlers, which are shed and re-



Common Species of Deer.

1, Elk or Wapiti. 2, Moose. 3, Fallow Deer. 4, Reindeer. 5, Musk Deer (enlarged).

parties to some obligation, or transferring property, and made complete and effective by delivery by the party bound thereby. In its broadest sense it includes formal contracts, bonds, and other obligations under seal, but today the term is almost exclusively applied to conveyances of interests in real estate. Deeds have now, under the technical name *grant*, almost entirely superseded other modes of conveyance of interests in land. Until delivered to the party who is to have the benefit of it, it is still an *escrow*. The perfected deed is compounded of the writing, the sealing, and the act of delivery.

Deeping, George Warwick (1877-

newed each year. Further points of distinction from the members of the family Bovidæ (cattle) lie in the teeth. In addition to the two central toes (digits three and four), on which the weight of the body is supported, deer almost always possess lateral toes, whose bony axis is more complete than in sheep and cattle. Deer are widely distributed over the globe, as well as from the Australian area. The various prominent forms are described elsewhere under their special names, as mule-deer, moose, etc. See E. Ingersoll's *Life of Mammals* (1906), and J. D. Caton's *Antelope and Deer of America* (1897).

Deerhound, The, is considered by some authorities to have sprung from the rough Scottish greyhound, while others claim its descent from the ancient Irish wolfhound. It is used for slipping at wounded stags or deer, to bring them to bay. Like the greyhound, the deerhound hunts by sight and not by scent; it also resembles that breed in general appearance, though it is thicker, stronger, and coarser in build. The hair on the side of the lip forms a mustache, which the greyhound does not possess.

Deer-Mouse, the popular name for several species of mice which are reddish above and white below, as the American white-foot (*Peromyscus*).

Deer-Stalking. The method of the chase of the red deer as practised in Scotland, where the sport has been popular for centuries, and the deer are now carefully protected except for a brief season. Deer-stalking is a very expensive sport. Great sums are paid for the lease of a noted preserve between the middle of August and the middle of October. It is useless to attempt the sport without the assistance of a stalker or guide, for an intimate knowledge of the ground is essential. Two or more gillies and two ponies follow. When the terms 'deer-stalking' or 'deer-stalker' are mentioned without explanation to a sportsman, he thinks at once of the sport of hunting the stag by stealthy approach as practised in the Highlands of Scotland, as described below. This is the perfection of the art of stalking game—that is, stealing up near enough to it to get a shot. The practice is a necessity in a treeless region such as northern Scotland, and for the same reason it is necessary to adopt similar methods in open regions elsewhere; but deer, as a rule, are denizens of wooded country; and in America the only opportunity afforded for practising the arts of stalking them are given by the mule-deer in the plains of the Upper Missouri region.

Stalking means skilful approach, up-wind, so that the hunter's scent shall not betray him; care that no rattling stone or snapping twig reach the alert animal's ear; stealing nearer and nearer by slow, painful advances from one bit of cover to another so that the stalker shall never be seen by the watchful eyes. Not only consummate skill, but great patience and endurance are necessary if the stalker is to succeed. Should the deer be within sight and raise their heads, the stalker must remain steady, permitting the deer to look twice at him, as is their habit. Then, if they appear unalarmed, he must take cover gradu-

ally, so that a quick movement may not awaken their suspicion afresh. Rough ground must be crossed stooping or crawling. Hurry is fatal to the sport, as a winded man cannot shoot straight. The best parts of the day for stalking are early morning and evening, when the deer are feeding. Regarding weather, a cloudy day is most favorable. See A. Macrae's *A Handbook of Deer-Stalking* (1880).

De Facto. That which exists in fact as distinguished from that which exists in law—*de jure*. A government may exist by force when it has no legal recognition or constitutional right to exist; it is then a *de facto* government.

Defamation is the essence of slander or libel; without defamation neither of these actions can be maintained. Defamation must be published either by spoken word, when it is called slander, or in writing, print, picture, stationery, or the like, when it is called libel. If there is no publication there is no liability. A spoken word may be shown to have caused pecuniary damage to the plaintiff; or the



Daniel Defoe.

plaintiff may have been charged with commission of crime; or existence of offensive contagious disease may have been imputed; or fitness for a profession, trade, or public trust may have been impugned; or unchastity may have been imputed to a woman. In these cases special damage resulting from publication of the defamation need not be shown, as they are defamatory *per se*, and the action will lie in them whether spoken or written. But publication of derogatory matter which is in fact untrue may not amount to defamation in a legal

sense in other cases, if not written. In a written imputation, technically called libel, it is enough to show the jury that the words complained of were such as to bring the plaintiff into ridicule, odium, or contempt. Slander, or spoken defamation, is never a criminal offense; in certain cases subversive of peace and order, libel may be a violation of criminal law. In some specified cases defamation, whether true or not, is excused or privileged. Illustrations of privileged defamation are words spoken on the witness stand in a court of law, confidential communications between employers, with reference to employees or servants, and statements made with regard to one's financial standing by mercantile agencies.

Default, generally, the failure to perform some legal or quasi-legal duty. Thus a defaulting trustee is one who misapplies or fails to account for trust funds. In legal procedure the failure to comply with certain rules of court—the failure to appear or plead within the specified time—places a party in default, and judgment by default may be given against him in his absence. In a sport tournament a contender who does not appear may lose by default.

Defeasance, a deed whereby the effect of another deed is nullified or defeated.

Defendant. The term is now generally applied to any one against whom an action is begun, but formerly it was used to denote the defendant in a personal action, only. In order to obtain a personal judgment the defendant must always be brought within the jurisdiction of the court by the personal service of a summons upon him.

Defender of the Faith was a title conferred on Henry VIII. by Pope Leo X. in 1521, to mark the church's appreciation of one of Henry's youthful excursions into the field of theology. It has since formed part of the official title of the sovereigns of England.

Deffand, Marie de Vichy-Chamrond, Marquise du (1697-1780), French letter-writer and *dame de salon*. Her *Correspondance* with Walpole and her *Lettres* to Voltaire were published together in four volumes in 1810 (new ed. 1864), and her *Correspondance Inédite* in 1877 (new ed.). See also her *Correspondance* with D'Alembert, Montesquieu, Hénault, etc. (1809; new ed. 1865); *Life of Madame du Deffand*, by Miss Berry (1834), and Tanentyre's *Women of the French Salons* (1901).

Defilade. In fortifications, the arrangement of a work so that men standing on the

terreplein behind the parapet shall be screened from the enemy's view and protected from his fire, is called defilading the work. See FORTIFICATION.

Definition. By a definition, in the widest sense, is meant such a description of the thing defined as will mark it out clearly from all other things with which it might be confused. Such a description may range from a mere enumeration of superficial characteristics patent to any observer to that determination of the inner nature of the thing which is possible only to the expert or man of science. See W. L. Davidson's *Logic of Definition* (1885).

Deflagration, in chemistry, is a rapid and local combustion which is specially marked in cases where salts capable of evolving oxygen, such as potassium nitrate, are thrown on to red-hot charcoal.

Defoe, Daniel (1659-1731), English novelist and pamphleteer, author of *Robinson Crusoe*, the son of a London butcher, born probably in 1659. One of his notable pamphlets, written in 1698, was an *Essay on Projects*, which advocated the joint-stock system, banks, the higher education of women, and income tax. The publication of his most famous pamphlet, *The Shortest Way with the Dissenters* (1702), brought down upon him the wrath of Anne's Tory government, and he was convicted of seditious libel, fined, stood three times in the pillory, and was imprisoned during her majesty's pleasure. While a traitor in the house of the Jacobites he turned novelist, and produced *Robinson Crusoe* (1719), *The Life and Piracies of Captain Singleton* (1720), *The Fortunes and Misfortunes of Moll Flanders* (1721), etc. In *Robinson Crusoe* he showed himself a master of fiction.

De Forest, Lee (1873-), inventor, was born at Council Bluffs, Ia.; educated at Sheffield Scientific School, Yale. A pioneer in the development of wireless telegraphy, he has been vice pres. Radio Telephone Co., and De Forest Radio Company, since 1913. He has taken out over 300 U. S. and foreign patents on radio telegraphy and telephony, is a pioneer inventor in talking motion pictures, and television. His most important invention, the audion—detector, oscillator and amplifier—made possible long distance telephony, both by wire and wireless.

Defregger, Franz (1835-1921), Austrian painter, born in the Pusterthal in Tyrol; was a pupil of Piloty in Munich (1867). In 1868 his *Speckbacher*, a picture of the Hofer rising of 1809, made him famous. Appointed

professor at Munich (1878) he painted his masterpiece, *Hofer going to his death*.

DeGaulle, Charles André Joseph Marie (1890-), Fr. gen., tank expert; served in World War I. Refusing to accept France's fall in 1940, he went to Eng., where he became, 1941, head of the Fighting French, and, 1943, chairman of the Fr. Nat. Comm. of Liberation. Aug., 1944, he became head of the Provisional Fr. Government, with complete authority over the Army, Navy and Air Force.

De Garmo, Charles (1849-1934), American psychologist and educator, born in Wisconsin. In 1891 he became president of Swarthmore College and, after 1898, professor of education in Cornell University.

Degas, Hilaire-Germaine Edgard (1834-1917), French painter, born in Paris. Usually classed with the impressionists, he was in fact the pupil of Ingres, though he departed from the classical tradition of composition, and introduced subject-matter hitherto deemed alien to art. Among his famous pictures are the much-discussed *Absinthe Drinkers*, the *Danseuse Assise*, and the *Danseuse*, and *La Première Danseuse*.

De Geer, Louis Gerhard, Baron (1818-96), Swedish statesman and author. He became prime minister and minister of justice in 1858-70. His great achievement was the reconstruction (1865-6) of the Swedish representative system, whereby a bicameral Parliament was substituted for the old system of the four estates (nobility, burgesses, clergy, and peasantry) sitting and voting in separate houses. As an author his speciality is the historical memoir.

Degeneration, in Biology. In certain cases the young animal possesses organs which not only display greater elaboration of structure than those of the adult, but which are apparently nearer the typical organs of the class. In these cases the adult is said to exhibit degeneration as compared with the young animal. An animal is also described as degenerate if its organs, or certain of these, display a lower grade of organization than that usual in the class to which it belongs, even if these organs are no better developed in the young animal than in the adult. In regard to even the proximate cause of degeneration we are much in the dark; but it is at least clear that there is a close connection between it and a limitation of the environment or to cessation of function. See *Degeneration*, by E. Ray Lankester (1880); T. H. Morgan's *Evolution and Adaptation* (1903).

Degree, the unit in terms of which an angle is generally measured. It is the ninetieth part of a right angle; or three hundred and sixty degrees are moved over by a radius, the outer end of which describes the whole circumference of a circle. The degree of an equation is the number which expresses the highest power of the variable.

Degree. A degree was originally a teaching license granted by a university; now it is an academical distinction or rank conferred by the authorities of a university (1) on its matriculated students who have complied with certain and duly specified attendance or residential regulations and have passed the necessary examinations, or have prepared and presented the required theses, and (2), *honoris causa*, on persons who have specially distinguished themselves in letters, art, music, science, public service, etc.

The master's degree originated in the 12th century in the Italian and French universities, but soon gave place, except in the faculty of arts, to the degree of doctor. The latter has generally been retained in England and America as the only honorary degree, the bachelor's and master's degrees being conferred only for work done. Bachelor of arts, science, divinity, law are still the standard degrees representing a completed preliminary course; master of arts and science, a graduate course of at least one year; doctor of philosophy, a graduate course of three years. In addition to these, degrees are now conferred in a large number of special departments representing specialized work. The peculiar scholastic dress associated with academic degrees is a development of the monastic habit. It consists of gown, hood, and cap, varying in form and color for the different faculties and grades. American usage recognizes but one form of cap, the Oxford or so-called 'mortar-board.' The distinctive feature of the costume is the hood, the shape, colors, and lining of which represent the university, the faculty, and the degree. See Leonard's *Cap and Gown in America*, Albany, 1896.

Deianira, wife of Hercules. Her story is the theme of Sophocles's play, *Trachiniae*.

Dei Gratia ('by the Grace of God'), an expression denoting absolute dependence on the Almighty will. Since the 15th century it has come to be relegated to the use of sovereigns, as implying their acknowledgment that their authority comes alone from God.

Deioces, or **Dajaukku**, according to Herodotus, was the first king of Media, reigning from 709 to 656 B.C., or correcting the historian's faulty arithmetic, from 700 to 647 (Nöldeke).

Deiotarus (d. 40 B.C.), king of Galatia, who helped the Romans in their wars with Mithridates. In 45 Cicero defended him on a charge of conspiring to murder Cæsar.

Deiphobus, a son of Priam and Hecuba. After the death of Paris he married Helen; and when Troy was taken he was slain by Menelaus.

Deira, the s. part of the ancient kingdom of Northumbria. It included the district between the rivers Humber and Tyne, with a part to the west.

Deism signifies generally belief in God, but is frequently used in contradistinction to theism, and in particular is applied to a rationalistic movement in England during the 17th and 18th centuries. See Leslie Stephen's *Hist. of Rationalism in 18th Cent.* (1876); Lechler's *Geschichte des Englischen Deismus* (1841).

Déjazet, Pauline Virginie (1797-1875), French actress. In 1859 she became manager of the Folies-Dramatique, under the new name of Théâtre Déjazet. See *Life* by Henry-Lecomte (1892).

De Kalb, Johann, Baron (1720-80), German-American soldier in the Revolutionary War, was born in Hüttendorf, Bavaria. France sent him on a secret mission to the American Colonies in 1768, and he returned to this country with Lafayette in 1777. He was made second in command to General Gates in the Southern army, and was mortally wounded at the Battle of Camden (Aug. 16). See Kapp's *Life* (1862).

Dekker, Eduard Douwes (1820-87), Dutch author, born at Amsterdam. He wrote *Max Havelaar* (1860), a work arraigning the conduct of the Dutch government in Java. His *Collected Works* were issued in 10 vols. in 1892. See *Lives*, in Dutch, by Busken-Huet (1885) and Meerkerk (1900).

Dekker, Thomas (1570-1641?), English dramatist and pamphleteer, born in London. Our knowledge of his life is scanty and uncertain. His pamphlets are mainly occupied with contemporary London life, especially the habits and haunts of thieves and vagabonds, a subject he also introduced into his plays. His prose pamphlets include *The Wonderful Year* (1603), a picture of London in a plague year, and *The Gull's Hornbook* (1609), a description of Elizabethan life about town. Of

his plays, the best are *The Shoemaker's Holiday* (1600), a comedy; *Old Fortunatus* (1600), a romantic extravaganza; *The Honest Whore* (in two parts, 1604 and 1630), Dekker's masterpiece in 'the comedy that transcends and plays with, rather than grasps and exposes, the vices and follies of men.' Dekker also wrote *Satiromastix* (1602), a reply to Jonson's *Poetaster*, in which he believed himself satirized under the figure of Crispinus. See Pearson's edition of the plays (4 vols., 1873); Grosart's edition of the prose works (in the Huth Library) (1885-6); also a selection of four plays in *Dekker* in the Mermaid Series (1887).

DeKoven, Henry Louis Reginald (1859-1920), American composer, born at Middletown, N. H. He devoted himself principally to the composition of light opera and songs. His first opera, *The Begum*, was produced in 1887, with Harry Bache Smith as librettist, and this successful partnership was continued in *Robin Hood* (1890) and *Rob Roy* (1894). Others of De Koven's operas are *Don Quixote* (1889), *The Highwayman* (1897), *The Mandarin* (1896), and *The Student King* (1906). Some of his songs, as 'Oh, Promise Me' and 'The Armorer's Song,' have been exceedingly popular.

de Kruif, Paul (1890-), bacteriologist and author. Was born in Zeeland, Mich.

De la Bèche, Sir Henry Thomas (1796-1855), English geologist, born near London. He founded the Museum of Practical Geology and the School of Mines (1851).

Delacroix, Ferdinand Victor Eugene (1799-1863), French historical painter, the representative leader of the romantic school, was born at Charenton. Delacroix's *Barque of Dante* (1822), and *The Massacre of Scio* (1824), aroused bitter hostility, and it was not until 1830 that Delacroix and the romanticists received state patronage. His subjects were largely drawn from the works of Scott, Byron, Shakespeare and Goethe; and his fine sense of color introduced a new element into French art. Among his chief works are the *Blind Milton Dictating Paradise Lost* (about 1826) and *Cromwell at Windsor Castle*. See Véron's *E. Delacroix* (1887), and Stranahan's *History of French Painting* (1899).

Delafield, Francis (1841-1915), American physician, born in New York. He became professor of pathology and practice of medicine in the College of Physicians and Surgeons, and, in 1886, first president of the Association of American Physicians and Pathologists.

Among his works are a *Handbook of Pathological Anatomy*, and *Studies in Pathological Anatomy*.

Delafield, Richard (1798-1873), American soldier and engineer, born in New York. In 1838 he was made superintendent of the United States Military Academy, which he reorganized and placed on a high plane. In 1864 he was appointed chief of United States Engineers, with the rank of brigadier-general.

Delagoa Bay, the southernmost port of Portuguese E. Africa, is 15 m. across. In 1887 Colonel Macmurdo, an American, formed a company for constructing a narrow-gauge line from Delagoa Bay to the Transvaal frontier at Komati Poort. A dispute arose with the Portuguese, who ventured to seize it. In 1890 the matter was referred to arbitration, and after a delay of ten years the Portuguese were adjudged to pay 15,000,000 francs by way of indemnity. On its shores stands Lorenzo Marques. During the S. African War it was the only port available for the Boers.

De la Mare, Walter (1873-), English novelist and poet, was in business until awarded a government pension. His fiction includes *Henry Brocken* (1904), *The Return* (1910), *Memories of a Midget* (1921). Among the poetic works are *The Listeners* (1912), *Fleeting and Other Poems* (1933).

De Lancey, James (1703-60), American jurist, born in New York. He was instrumental in drawing up the Montgomery charter of New York city, and was a justice of the Supreme Court from 1731 and its chief justice from 1733. He served twice as lieutenant-governor, in 1747-55 and 1757-60. He assisted in founding King's College (Columbia College).

De Lancey, Oliver (1708-85), Loyalist soldier in the American Revolution. He took part in the disastrous attack on Fort Mifflin in July, 1758, as colonel of the New York city regiment, for which he received the thanks of the assembly. He subsequently raised three regiments of Loyalists, was commissioned brigadier-general, and given command of Long Island, remaining there until the close of the war.

Delancey, Oliver (1752-1822). A British soldier born in Edinburgh. He took part in the battles of Bunker Hill and Long Island, and succeeded Major André as adjutant-general. Returning to England, he entered Parliament, and became a general in 1812.

Deland, Margaretta Wade (Margaret

Deland) (1857-1945), Am author, was born (Campbell) at Allegheny, Pa. Her first book was *The Old Garden*, and *Other Verses* (1886). Other works include *The Wisdom of Fools* (1897), *Old Chester Tales* (1898), *Dr. Lavendar's People* (1898), *The Common Way* (1904), *The Iron Woman* (1911), and *Captain Archer's Daughter* (1932).

Delane, John Thaddeus (1817-79), editor of the *Times*, was born in London. Joining the *Times* as assistant editor in 1839, he so impressed the proprietor with his capabilities that in 1841 he was appointed editor. He retained this position for thirty-six years and raised the *Times* to a position of importance and power unknown before or since.

Delano, Columbus (1809-96), American politician, born at Shoreham, Vt. Under Grant he was appointed Commissioner of Internal Revenue and reorganized the service. From 1870 to 1875 he was Secretary of the Interior.

De la Ramée, Louisa. See **Ouida**.

Delarey, or De la Rey, Jacobus Herk-laas (1848-1914), assistant commandant-general of the Transvaal forces in the Boer War of 1899-1902. He captured Lord Methuen at Tweebosch (March 7, 1902), but was repulsed by General W. Kitchener (March 31). He was a Progressive in politics, favoring a large franchise concession to the Uitlanders, and disapproved of the policy of President Kruger.

Delaroché, Hippolyte, called **Paul** (1797-1856), French painter, born in Paris. He dissented early from the classicism of David, and introduced the stage-dramatic representation in historical painting that prevailed throughout Europe during two-thirds of the 19th century. In 1827 he received the decoration of the Legion of Honor for his *Capture of the Trocadéro*, was elected a member of the Institute in 1832 and professor at the Ecole des Beaux-Arts in 1833. In 1834, after his return from Italy, he was commissioned to decorate the amphitheatre of the Ecole des Beaux-Arts. His most famous pieces are *Cromwell at the Coffin of Charles I* (1831); *The Princes in the Tower*; *The Execution of Lady Jane Grey* (1834); *The Murder of the Duke of Guise* (1835). See J. Ruutz-Rees's *Paul Delaroché* (1880); Tytler's *Modern Painters and Their Painting* (1899).

de la Roche, Mazo (1885-), Canadian novelist; wrote the series of books dealing with the Whiteoaks of Jalna.

De La Rue, Warren (1815-89), English astronomer, born in Guernsey. He made a

special study of solar conditions in relation to electricity, and did much to develop solar physics and astronomical photography

Delaunay, Marguerite Jeanne. See **Staal.**

De Laval, Carl Gustav Patrik (1845-1913), Swedish inventor, was born in Blasenborgs. His most important inventions are the steam turbine and the cream separator which bears his name.

Delavigne, Jean François Casimir (1793-1843), French poet and dramatist, was born in Havre. He was educated in Paris and at seventeen composed an *Ode* on the birth of the king of Rome (Napoleon's son). Devoting himself to literature, he wrote *Mes-sénienes* (1815), a series of satires against the restored French monarchy; and during the decade 1820-30 produced his principal plays including: *Les Vêpres Siciliennes*, a tragedy (1818); *L'Ecole des Vieillards* (1823), probably his ablest composition; and *Marino Faliero* (1829). His finest lyric was the ballad entitled *La Toilette de Constance*. A collected edition of his works appeared in 1885 Consult *Life*, in French, by Vacheux.

Delaware (popularly called the 'Diamond State'), one of the original thirteen States, belonging to the group called the Middle States. It is bounded on the n. by Pennsylvania; on the e. by the Delaware River, Delaware Bay, and the Atlantic Ocean; on the s. by Maryland; and on the w. by Maryland and Pennsylvania. The State covers an area of 2,370 sq. m. of which 405 sq. m. are water, and is, with the exception of Rhode Island, the smallest State in the Union. Constituting a part of the Atlantic coastal plain, Delaware exhibits little relief in surface features. Although there are some rolling and hilly lands in the northern part, most of the State is nearly level. At the southern border of the State, extending into Maryland, is the great Cypress Swamp, 12 m. in length, and covering 50,000 acres. The climate is mild, with ample rainfall, favorable for farming, and is generally healthful. Clay soils prevail in the n., and are the best for general agriculture, especially when treated with marl. The sandy loams of the middle belt are devoted to fruit and berry and vegetable culture, while the sandy soils of the south are given largely to strawberry and peach growing. The marsh lands, when drained, produce good crops. Corn, wheat, and hay are the principal crops.

Delaware has no extensive mineral deposits, and the mining industry is chiefly restrict-

ed to quarrying granite, marble, and serpentine for building purposes. Clay, the chief mineral product, is used principally for manufacturing brick and tile, and is found in the northern part of the State. The principal industry is the manufacture of leather. Pulp goods rank next in importance. In the northern part of the State the Delaware and Chesapeake Canal (13½ m.) connects the Delaware River with Chesapeake Bay. In 1927 it was made into a sea-level canal. The population of Delaware is 266,505. The largest cities are Wilmington, 112,504; Dover, the capital, 5,517; New Castle, 4,414. The constitution of Delaware now in force was adopted in 1897. The executive officials comprise the Governor, Lieutenant-Governor, Attorney-General, Insurance Commissioner, the Secretary of State, and Treasurer and Auditor of Public Accounts. The legislature, termed the General Assembly, consists of a House of Representatives of 35 members, elected for two years, and a Senate of 17 members, elected for four years.

Under the Reapportionment Act, Delaware sends one member to the National House of Representatives. Dover is the State capital. Delaware takes its name from Lord De la Warr, governor and first captain-general of Virginia, the name having been originally applied to Delaware Bay by the Virginians. The region was included in the British claim as a part of Virginia; but the Dutch, in virtue of the discovery of the Delaware River by Hudson, in 1609, and the subsequent explorations of Mey, ignored this claim, and in 1631 founded a colony on Lewes Creek. The settlers soon aroused the hostility of the Indians, who destroyed the colony.

In 1638 a Swedish settlement under Peter Minuit was established near the present site of Wilmington, and the country was called New Sweden. During the period 1640-55 the Swedes and the Dutch of New Netherland waged almost incessant warfare, until the latter finally succeeded in gaining the ascendancy. In 1664 New Netherland fell into the hands of the English, and Delaware remained under English rule, with the exception of a brief interval in 1673-4, when the Dutch regained control, until the War of the Revolution. The Duke of York made over the territory to William Penn in 1682 and Delaware (the 'Three Lower Counties on the Delaware') was considered a part of Pennsylvania until 1703, when it was allowed a separate legislature, continuing to be, however, under the proprietary government of Penn-

sylvania. In 1776 an independent State government was established. Delaware has the distinction of being the first State to ratify the United States Constitution (Dec 7, 1787).

Consult Bevan and Williams' *History of Delaware* (4 vols. 1929); Brandt's *Majestic Delaware* (1929); Powell's *History of Delaware* (1928); Vallandigham's *Delaware and the Eastern Shore* (1922); Johnson's *The Swedish Settlements on the Delaware* (1912); *Papers of the Historical Society of Delaware* (1879-).

Delaware, city, Ohio, county seat of Delaware co. It is noted for its mineral springs. Ohio Wesleyan University is situated here; p. 8,944.

Delaware Bay, an arm of the Atlantic Ocean between New Jersey and Delaware. The width at the entrance, between Cape May and Cape Henlopen, is little more than 10 miles, and the greatest width within is about 25 m. It is about 40 m. in length, and tapers gradually to the estuary of the Delaware River. A safe harbor is formed near Cape Henlopen by a huge breakwater, constructed by the U. S. Government. Delaware Bay is connected with Chesapeake Bay by a coastwise canal.

Delaware River, an important river in the Eastern United States, rises in the Catskill Mountains, N. Y., and follows a southerly course, forming part of the boundary between New York and Pennsylvania, and the entire boundary between New Jersey and Pennsylvania. It becomes tidal at Trenton, the head of navigation, and below Philadelphia widens gradually, expanding into Delaware Bay. The total length is 410 m.; the drainage basin is 12,012 sq. m. The Delaware has been called the American Clyde because of the shipbuilding industries along its banks. Consult Halsey's *Four Great Rivers*.

Delaware River Port Authority, a body created by the New Jersey Legislature in June, 1931, to supervise transportation development between Camden, N. J., and Philadelphia.

Delawares, a tribe of North American Indians, of the Algonquin family. In 1664 they occupied Delaware, New Jersey, Pennsylvania, and New York; and it was with a tribe of this nation that Penn made his famous treaty of 1682. Like the Iroquois, the Lenni Lenâpé formed a league or confederacy, the 'Five Delaware Nations.' Large numbers of Delawares were converted by Moravian missionaries in the 17th and 18th

centuries. The bulk of the nation (about 1,000) is now in Oklahoma.

Delaware, University of, a State institution for higher education at Newark, Del., founded under private control as 'Newark College' in 1833, and renamed 'Delaware College' in 1843. In 1914 the Women's College was established by Act of Legislature. In 1921 the name was changed by Act of Legislature from 'Delaware College and the Women's College' to the 'University of Delaware,' without change in form of organization or administration. For most recent statistics see Table of American Colleges and Universities under the heading UNIVERSITY.

Delaware Water Gap, borough and summer resort, Monroe co., Pennsylvania, at the gap where the Delaware River breaks through the Kittatinny Mountains. The Delaware River flows through the gorge for about 2 m. between picturesque cliffs 1,000 to 1,200 ft. high; p. 443.

De La Warr, Thomas West, Third Baron (1577-1618), colonial governor of Virginia, was born in Hampshire, England. He interested himself in the plans for the colonization of Virginia; became a member of the council of Virginia in 1609; and the next year was appointed first governor and captain-general for life. He sailed for Virginia in March, 1610, arriving at Jamestown in June with additional emigrants and supplies just in time to forestall the abandonment of the colony. Forts Henry and Charles, at the mouth of the James River, were established by him, and named for the king's sons. He had returned to England by June, 1611, and in that year published his *Relation . . . of the Colony Planted in Virginia*. The bay, river, and State of Delaware perpetuate his name.

Delbrück, Martin Friedrich Rudolf von (1817-1903), Prussian statesman, was born in Berlin. During the war of 1870-1 he practically governed Berlin, king and chancellor being absent. Later it became his duty to arrange the details of the new constitution of the empire.

Delcassé, Théophile (1852-1923), French statesman, was born in Pamiers, department of Ariège. He was Minister of Foreign Affairs in the Brisson, Dupuy, Waldeck-Rousseau, Combes, and Rouvier Cabinets, resigning from the last-named in 1905. His proposals regarding the settlement of the Chinese question after the Boxer Rebellion were accepted by the powers. In 1903-4 he coöperated in establishing cordial relations between France

and England, and, in conjunction with Lord Lansdowne, prepared the Anglo-French agreement signed on April 8, 1904. He was Minister of Foreign Affairs (1914-15). He was a chevalier of the Legion of Honor.

Del Credere Agent, an agent for the sale of goods who, in consideration of an additional commission known as *del credere* commission, undertakes to indemnify his principal against loss occurring through the insolvency or failure to complete their contracts



Delaware Water Gap, from the New Jersey Side.

of persons with whom he transacts business. See FACTOR; PRINCIPAL AND AGENT.

Deledda, Grazia (1873-1936), Italian novelist, was born in Nuoro, Sardinia. She received the 1926 Nobel prize for literature. Her published works include *La Giustizia* (Justice), *Reeds in the Wind*, *Ashes*, *The Mother*, *Nostalgia*.

Delegate, one who is elected or appointed to act for another person or number of persons. The term is used in the United States for Territorial representatives in Congress, for members of the lower house of the Virginia, West Virginia, and Maryland legislatures; for members of the lower house of the Protestant Episcopal General Convention, and in various other assemblies.

Delegate Apostolic, a papal representative, of lower rank than a nuncio, appointed to missionary countries, to countries that have not diplomatic relations with the Vatican (the United States, Mexico, Canada), and, with the addition of the title Envoy Extraordinary, to certain countries that maintain such rela-

tions (Colombia, Peru, and other South American republics).

In the United States the office (established in 1893) is of great importance, the power of the apostolic delegate to decide cases without appeal having been confirmed by the Holy See in 1909.

Delegate, Walking, the business agent employed by some trades unions in the United States. His duties are to discover and report to his union violations of agreements; and where a general arbitration board exists, to appear before it as a witness.

Delegation, a name given to the administrative divisions of ancient Lombardy and Venice, also to the states of the Church. The term is also applied to the local representation in Alsace-Lorraine.

Delfshaven, or **Delftshaven**, town, Holland, now a western suburb of Rotterdam. It is the port where the Pilgrim Fathers embarked on July 22, 1620, for New England. It is also the birthplace of Admiral Piet Heijn. See ROTTERDAM.

Delft, mediæval town of the Netherlands, in the province of South Holland. It was for generations the burial place of the princes of the House of Orange. In the 17th and 18th centuries it was famous for its beautiful porcelain, and has of recent years again become a center of the Dutch china and pottery industry; p. 49,407.

Delhi, (*Sháh Jahánabád*), city, capital of British India, in the Punjab, on the Jumna River. A high wall, 5½ m. in circumference, surrounds the city, which, except in the native quarter, is laid out in broad streets and open spaces. The magnificent palace (now called the Fort, and used in part for military purposes) and the Jama Masjid, the largest cathedral mosque in India, are monuments of Sháh Jahan, who, in the 17th century, founded the present city. The Hall of Private Audience, in the palace, was the setting for the famous Peacock Throne, made of precious stones, which was carried off to Persia by Nadir Shah (1739). Beyond the walls, to the s., can be traced the sites of ancient Delhi.

In recent years Delhi has experienced great industrial and commercial development, following the improvement of transportation facilities, and has become the distributing center for the whole of Upper India.

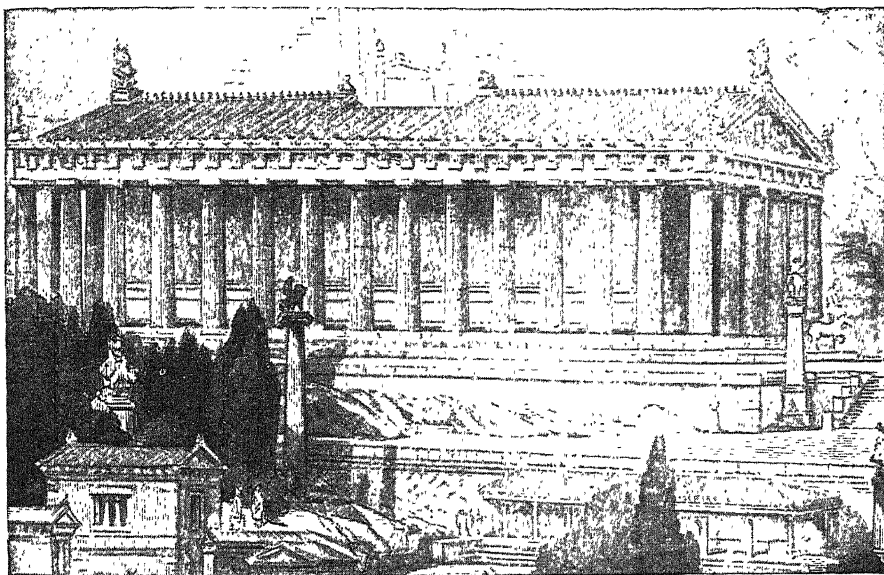
The plains about Delhi, with the ancient city Indraprastha, were the scene of the Hindu epic Mahabharata; and in the first Christian centuries new capitals were built by

successive dynasties on or near the same site. Once the seat of Buddhist religious life and culture, Delhi became in the 12th century the splendid capital of the Moslem (Mogul) Empire, and the center of Mohammedan power. It was sacked by the Persian Nadir Shah in 1739, at which time there was appalling massacre and treasures worth millions were carried away. In 1759 it was captured by the Mahrattas who held it until 1803 when it was taken by Lord Lake. In the Sepoy War the rebel troops made it their headquarters, and it was captured by the British under General Nicholson, after a siege of nearly four months. (See MUTINY, INDIAN).

Delibes, Clément Philibert Léo (1836-91), French musical composer, was born in St. Germain-du-Val (Sarthe). His most famous opera was *Lakmé*, which was produced in Paris in 1883.

Delilah, a Philistine woman, beloved by Samson, who was induced by a bribe to betray him to her countrymen. While he was asleep she cut off his hair, which she had learned was the source of his great strength, and he was easily captured. Consult Judges xvi. 4-31.

Deliquescence, a property which certain substances possess of attracting moisture from the air, and thereby becoming liquid—e.g.,



Temple of Apollo at Delphi (restored).

Delhi was the scene of the great coronation durbars of Jan. 1, 1903, and Dec. 12, 1911. (See DURBAR.) At the latter, proclamation was personally made by King George of the transfer of the capital of India from Calcutta to Delhi; p. 304,420. Consult Fanshawe's *Delhi, Past and Present*, Finnemore's *Delhi and the Durbar*.

Delian League (Confederacy of Delos), a confederacy of Ionian cities, founded in 478 B.C., with the object of presenting a united front to the common enemy, Persia, and of ridding the Ægean Sea of pirates. The League was dissolved in 404 B.C.; but was revived in 378, with the object of opposing Sparta, and lasted until 338. See GREECE, *History*.

chloride of zinc, chloride of magnesium, and nitrate of copper.

Delirium, a condition of temporary mental disorder, associated particularly with unreasonable, rambling, disjointed speech. It may accompany direct brain injury or disease; but in some people it is likely to be present whenever body temperature rises above a certain point. It is a symptom, not in itself a disease. See DELIRIUM TREMENS; FEVER; INSANITY.

Delirium Tremens ('trembling delirium'), that form of acute mania which follows the excessive and long continued drinking of alcoholic liquors. The onset may be comparatively gradual; or it may come on suddenly.

The patient sees dogs, cats, snakes and other reptiles, devils, and loathsome insects. The condition usually lasts from four to seven days, and leaves the patient in an exhausted state. Pneumonia is a common complication. See ALCOHOLISM

Delisle, Léopold Victor (1826-1910), French historian and bibliographer, was born in Valognes, department of Manche. He served as assistant in the department of manuscripts in the Bibliothèque Nationale, in Paris, from 1852 to 1874, general administrator of the library from 1874 to 1905; and librarian for the Chantilly collection of the Institut de France from 1905 to 1910.

Among his books are *Le cabinet des manuscrits de la Bibliothèque Impériale* (3 vols., 1868-81); *Recueil des actes de Henri IV.* (1909).

Delitzsch, Franz (1813-90), German theologian, was born in Leipzig. He was one of the greatest Hebraists of the 19th century, his commentaries on Habakkuk, Job, Psalms, Proverbs, Song of Solomon and Ecclesiastes, Isaiah, and Genesis being of the highest value. His translation of the New Testament into Hebrew is considered a classic.

Delitzsch, Friedrich (1850-1922), German Assyriologist, son of above; born in Erlangen; visited the U. S. Jan., 1906, and lectured at Columbia University and elsewhere. Among his works are *Assyrische Studien* (1874); *Zur Weiterbildung der Religion* (1908); *Das Land ohne Heimkehr* (1911).

Delium, town in Bœotia, ancient Greece, near frontier of Attica; named from a temple of the Delian Apollo close by. Nearby the Bœotians defeated the Athenians in 424 B.C.

Delius, Frederick (1863-1934) Eng. composer; wrote operas, orchestral and choral works, chamber music, songs, etc.

Delius, Nikolaus (1813-88), German philologist and Shakespearean scholar, was born in Bremen. His chief work was *Abhandlungen zu Shakespeare* (1878 and 1887).

Delivery, in law. See **Deed**; **Possession**.

Della Casa. See **Casa**.

Della Robbia. See **Robbia**.

Dellys, maritime town and military post, Algeria, 50 m. e. of Algiers. Some Roman remains have been found, and the site is thought to be that of ancient Cissi; p. 13,949.

Del Mar, Alexander (1836-1926), American mining engineer and political economist, was born in New York City. In 1865 he organized the U. S. Bureau of Commerce, Navigation, Emigration, Mining, and Statistics (now the Department of Commerce and

Labor), and was its director from 1865 to 1869. His numerous publications include *History of the Precious Metals* (1879; a new edition, 1911); *History of Monetary Systems* (1908), *Chronology of America from Pytheas of Marseilles to the Death of Charles V.* (1921).

De Long, George Washington (1844-81), American explorer, was born in New York City. From 1879 to 1881 he commanded the *Jeannette*, fitted out by James Gordon Bennett for Arctic exploration under government auspices. The *Jeannette* was crushed by the ice in June, 1881. De Long's boat reached the mainland but he and his party perished before assistance came.

Delorme, Marion (1631-50), a celebrated French courtesan, was born in Baye Castle, Marne. Her career is dramatized by Victor Hugo (1829), and treated in Alfred de Vigny's *Cinq-Mars* (1826); also by G. P. R. James in *De L'Orme* (1830).

Delos, Megale and **Mikra**, small Greek islands of the Cyclades in the Ægean Sea. Greek story said that Poseidon raised Mikra Delos from the sea, and that it floated until Zeus fastened it to the bottom of the sea, that it might be a secure abode in which Leto might give birth to Apollo and Artemis. From the earliest ages it was a great center for the worship of Apollo. The ruins of the temple of Apollo and of the ancient town have been thoroughly explored by the French Archæological School, which began work there in 1873, and continued it until 1889. The quinquennial festival of Apollo, celebrated with games and other competitions, brought multitudes of visitors; and the sanctity of the island was inviolable. For the excavations, see Homolle's *Delos* (1887).

Delphi (now **Kastri**), a small tn. in Phocis in ancient Greece, made very famous by its association with the worship of Apollo. From the earliest times it was a sacred place to the primitive inhabitants of Greece, who worshipped, probably, the earth-goddess there. The worship of Apollo came into prominence with the immigration into Central Greece of the Dorians, the true Hellenic tribes. The site was thoroughly excavated and explored by the French Archæological School from 1892 onwards. In 1903 a museum was opened. The great temple was approached by a winding path—"the Sacred Way." Under the temple ran the Cassotis stream, from the ravine of which arose the vapor that inspired the Pythian prophecies. For the antiquities, see *Pausanias* (Frazier's ed. 1898), *Bulletin de*

Correspondence Hellénique (1893, etc.), and *Fouilles de Delphes 1892-1901* (ed by Homolle, 1902).

Delphin Classics, a set of Latin and Greek classics, in sixty-four volumes, edited in France (1674-1730) by thirty-nine scholars, under the superintendence of Montausier, Madame Dacier, Bossuet, and Huet, for the use of the son of Louis XIV., called the Grand Dauphin

Delphinium, or **Larkspur**, a genus of hardy plants belonging to the Ranunculacæ. Among the species are a blue-flowering American kind; stavesacre, a native of the s. of Europe, having dingy blue flowers, and yielding seeds which are used in the preparation of an ointment to destroy pediculi; a Calitornian annual, with scarlet flowers in late summer; and a sulphur-yellow variety. Delphiniums are easily reared from seed sown in spring.

Delphinus, a constellation to the e. of Aquila, of small size, but prehistoric antiquity. Its identification with the fabulous cetacean procured it the title of Vector Arionis, and it was also known to the Greeks as the 'Sacred Fish.' W Delphini is a remarkable eclipsing star, discovered by Miss Wells in 1895 from an examination of photographic records.

Delta, the alluvial plain built out into a body of relatively still water (sea or lake) by a river. It is normally fan-shaped in plan, and the resemblance of this plain at the mouth of the Nile to the Greek letter Δ gave it its name, delta. A sluggish river brings fine silt, which is easily transported, and also easily disturbed, by currents. In the cases of deltas where the streams are swift and easily transport waste material of varying sizes, the suspended matter becomes assorted when the current is checked: the finer mud is carried farthest out, and forms the foundation; the finer sand is dropped nearer the river mouth, round which the coarser sand and pebbles accumulate, and form a steep slope, which may even be 35°. As this is extended, the usual river deposits are laid down on the top with gentle dips. The delta of the Volga measures 280 m. from apex to base; that of the Mississippi, 200 m.; that of the Nile, 110 m.

Delta Metal is an alloy of copper, zinc, and a little iron, patented in 1883-4 by A. G. Dick. It is a very tough brass, and is capable of being forged. The cast metal resists a tensile strain of 20 tons per square inch, which is raised to about 30 tons by rolling or cold forging.

Deltoid, in anatomy, the delta-shaped muscle which caps the shoulder-joint, uniting the shoulder-blade and the arm; its principal action is to raise the upper arm from the side.

De Luc, Jean André (1727-1817), Swiss geologist and philosopher, invented an hygrometer and a portable barometer. He wrote *Recherches sur les Modifications de l'Atmosphère* (1772), *Lettres, Physiques et Morales, sur l'Histoire de la Terre* (1778-80), *Nouvelles Idées sur la Météorologie* (1786), *Bacon tel qu'il est* (1800), and *Voyages Géologiques* (1810-13).

Deluge, **The**, a flood of unparalleled proportions with which, according to the book of Genesis, God overwhelmed the world as a penalty of its wickedness; sometimes called the Noachian Deluge. The story is certainly composite, and it is impossible to construct from the Biblical narrative anything like a uniform and detailed account of the event.

Deluge legends are of common occurrence in folklore and early literature, the classical story of Deucalion and Pyrrha being typical of similar myths in India, Persia, Babylonia, Syria, and Asia Minor. The Babylonian tradition presents a striking correspondence with the Biblical story. It relates how Par-napishti or Xisuthros was forewarned by Ea, the god of wisdom, of the coming catastrophe, and commanded to construct a huge vessel. Accordingly, he builds a ship 600 cubits long, 60 broad, and 60 in height, smears it with bitumen, brings in the members of his family and the animals, and shuts the door. A storm of six days ensues. When the waters begin to abate, Xisuthros steers for Mount Nizir, and sends forth in turn a dove and a swallow, which return; then a raven, which does not. Xisuthros then comes out, offers a sacrifice to the gods, who are well pleased with it, the rainbow appears in the sky, and a covenant is struck between Xisuthros and Bel, the former, together with his wife, being now exalted to the godhead.

It is now widely held that, as the Babylonian account is the older, the narrative in Genesis must have been borrowed from it, though some authorities believe that they are both derived independently from a common Semitic source. The principal difference is in the virtual monotheism of the Hebrew as against the polytheism of the Babylonian story.

Consult R. Andree's *Die Flutsagen*, the classic on the subject; Dillmann's *Commentary on Genesis*; Hl'precht's *The Earliest Ver-*

sion of the *Babylonian Deluge Story* (1910); Fiske's *The Great Epic of Israel* (1911); Jastrow's *Hebrew and Babylonian Tradition* (1914).

Delusion, in pathology and psychology, a false conviction so fixed that not even the evidence of the senses will convince the patient of his error. It differs from illusion and hallucination in that it always involves a mental error. Familiar types of delusion are those of grandeur and persecution. See *INSANITY*; *PARANOIA*.

Delyannis, or **Delijannis**, **Theodore** (1826-1905), Greek statesman, four times premier of Greece, was responsible for extension of Greek territory, granted at the Congress of Berlin, 1878.

Demades, Athenian orator, prominent from about 350 to 318 B.C. A member of the Macedonian party from 335 to 323 (when Alexander died) he, along with Phocion, exerted a considerable influence at Athens. He was executed by Antipater for treachery.

Demaratus, king of Sparta from about 510 to 491 B.C., when he was deposed. He retired to the Persian court, and accompanied Xerxes in his invasion of Greece (480 B.C.).

Demarteau, Gilles (1722-76), one of the most eminent exponents of the style of engraving which imitates crayon drawing, bringing the process to great perfection and creating a typical academic style of drawing. His work was chiefly after the French masters, especially Boucher.

Demavend, Mount, extinct volcano with conical summit and crater still intact, in the Elburz Mountains, Persia, 45 m. n.e. of Teheran; altitude, 18,600 feet.

Deme, in Greek history, in its original sense, meant the district inhabited by a tribe, forming an independent community; the word 'deme' came to mean a country district, township, or parish. The demes were particularly important in the constitution of Attica. Every Athenian was formally designated by his own name, his father's, and that of his deme.

Dementia. See *Insanity*.

Demesne, or **Demain**, under the feudal system, a term signifying actual dominion over land as opposed to the theoretical dominion of the king or over-lord. *Ancient demesne* signifies lands vested in the king at the time of the Norman Conquest; also the form of tenure by which these lands were held. See *TENURE*.

Demeter, called **Ceres** by the Romans, was one of the chief divinities of the Greeks,

her name signifying Earth-mother. She was patroness of agriculture and of fruits, and was the sister of Zeus, by whom she became the mother of Persephone.

Demetrius, or **Dimitri**, the name of several pretenders to the Russian throne between the years 1603 and 1613.

Demetrius I., of Macedonia (337-283 B.C.), surnamed *POLIORCETES*, 'the Besieger,' from his skill and success in conducting sieges, was a son of Antigonus Cyclops, king of Asia.

Demetrius I., of Syria (c. 187-150 B.C.), surnamed *SOTER*. As a child he was sent as a hostage to Rome, where he remained until he was twenty-three. Escaping to Syria in 163, he was received as king by the Syrians.

Demetrius II., of Syria, surnamed *Nicator* (164-125 B.C.), son of Demetrius Soter, was king from 146 to 142 B.C., having put down the insurrection against his father, and was again king from 128 to 125 B.C.

Demidoff, a Russian family distinguished for wealth and beneficence, descended from Nikita Demidoff, originally a blacksmith at Tula, who in the time of Peter the Great became famous as a manufacturer of arms, and amassed an immense fortune. The most famous prince of the line is Prince Anatol (1813-70), eminent in letters and in the sciences; his principal work being his *Travels in Southeast Europe* (4 vols. 1839-49).

De Mille, Cecil Blount (1881-), American playwright, actor, and motion-picture producer, best known as a producer of elaborate motion-pictures. Among some 60 productions are 'The Ten Commandments,' 'King of Kings,' 'The Sign of the Cross,' and 'Feet of Clay.' He has been identified with the motion-picture business since 1913, and is president of Cecil B. DeMille Productions, Inc.

De Mille, Henry Churchill (1850-93). American dramatist. His first play, *Delmar's Daughter*, was produced in 1883. It was followed by *Sealed Instructions* and *Young Mrs. Winthrop* and *The Main Line*. He subsequently entered into a literary partnership with David Belasco, writing with him *The Wife*, *Lord Chumley*, *The Charity Ball*, *Men and Women*, and other dramas.

De Mille, James (1833-80), Canadian author, wrote a large number of novels, including *Andy O'Hara* (1860); *The Dodge Club* (2 vols. 1866-9); *Helena's Household* (1868); *The Living Link* (1874); *A Castle in Spain*, and *A Strange Manuscript Found in a Copper Cylinder*, the two last named published posthumously.

De Mille, William Churchill (1878),

American playwright, son of Henry Churchill De Mille. His plays include *Strongheart*, *The Warrens of Virginia*, *The Land of the Free*, and *The Woman*. He collaborated also in the authorship of *The Genius*, *The Royal Mounted*, *Classmates*, and *The Forest Ring*.

Demise, a legal term signifying the transference of an estate by will or lease for a term of years, or, less often, for life. When used in a lease at common law the word demise implied a covenant for quiet enjoyment, and no other word had this effect. In English law the term is also employed to denote the transmission or passing of all sovereign

the first three methods to the complete exclusion of the last

The plan of demobilizing by military classes can be followed only in those countries where a system of universal military training is in operation, and hence is inapplicable in the case of the American Army. Under this plan the soldiers are demobilized according to their ages, the oldest men being the first to be returned to civil life. These are succeeded by the next oldest class, and so on.

Following the Great War (1914-18) the U. S. War Department decided to effect the demobilization of the Army by organized units, the plan to be modified, however, so as to permit the discharge, in proper cases, of individuals in advance of the demobilization of the organizations in which they were serving. While it is of prime importance that the Army shall be demobilized as rapidly as military considerations will permit, care must be taken not to discharge the men so rapidly as to disorganize industrial conditions. As the result of the signing of the armistice orders for war material practically ceased and the demand for labor fell off markedly. Plans were at once laid to demobilize the forces in the United States in the following order: 1. development battalions, 2. conscientious objectors not serving sentences, 3. Spruce Production Division, 4. central training schools for officers, 5. United States Guards, 6. railway troops, 7. depot brigades, 8. replacement camps, 9. combat divisions.

Many details incident to demobilization demand careful attention. Only a few will be mentioned for the purpose of illustration. Before discharge each soldier must undergo a critical physical examination, for it is the policy of the War Department to return no man to civil life until he shall have become as nearly fit physically as medical and surgical skill can make him. A copy of the report of physical examination must be transmitted to the Bureau of War Risk Insurance if he has been disabled in the service, in order that he may receive compensation provided by law. Every soldier must receive the full amount of pay due him after settlement of his indebtedness to the Government, and to this end his accounts must be scrutinized. His discharge certificate must be executed and delivered to him, and transportation to his home provided.

Democracy, a term signifying by its derivation government by the people, and particularly contrasted since Aristotle (333 B.C.) with monarchy, or the government of one,



Associated Press Photo.

Cecil B. DeMille.

rights and properties to the successor of a sovereign, upon the latter's death or abdication. It is spoken of as 'the demise of the crown.'

Demurge, the name applied by Plato in the *Timæus* to the creator of the universe, who stands between the pure 'ideas' and chaotic matter and combines them in the actual world. Among the Gnostics he is identified with Jehovah, the God of the Old Testament.

Demobilization, the breaking up and discharging of an army. The demobilization of a great military force may be accomplished in four ways: by military classes; by trades, professions, etc.; by organizations; by individuals. In practice, however, it is found to be inadvisable to attempt to adopt either of

on the one hand, and with aristocracy or oligarchy, the government of the few, on the other. In modern political science the meaning of the term varies. By continental writers it is commonly used to designate a society based upon political, economic, and social equality. By English and American authorities it is applied in a somewhat narrower sense to that form of government which derives its powers from the consent of the governed, and to the state in which such a government exists, whether its outward form be that of a monarchy, as in Great Britain, or of a republic, as in France and the United States.

The history of democracy may be traced back to ancient Greece. The Grecian states, however, differed fundamentally from modern democracies, first in that they were immediate or 'pure' democracies rather than mediate or representative, only those citizens who were actually present at the assemblies voting, and then not as representing the will of the people but merely as expressing their individual desires; second, in that the franchise was limited, the great mass of the people being excluded from political rights; third, in the conception that the citizens lived for the state rather than that the state existed for the citizen—the ruling principle of modern autocracy.

'Modern democracy,' said Woodrow Wilson, 1901, 'wears a very different aspect and rests upon principles separated by the whole heaven from those of the Roman or Grecian democrat. Its theory is of equal rights without respect of blood or breeding. It makes the general welfare of society the end and object of law and declares that no class, no aristocratic minority, however numerous, however capable, however enlightened, can see broadly enough or sufficiently free itself from bias to perceive a nation's needs in their entirety or guide its destinies for the benefit of all. The consent of the governed must at every turn check and determine the action of those who make and execute the laws.'

Such a conception of democracy is of comparatively recent development. It may be said to have manifested itself first in the great Reformation which swept over Europe in the 16th century. Politically it found expression in the British revolution of 1688 and the overthrow of James II.; a century later it reached a fuller development in the French Revolution; while the history of the 19th and 20th centuries is a history of its progress not only in Europe but in Asia as well.

In the United States the idea of democracy,

or self-government, was a powerful factor even before the Revolution, taking national form in the Declaration of Independence and the Constitution. Among the more recent advances in the United States are the widespread extension of the suffrage to women; the initiative, referendum, and recall; the popular election of senators; and the direct primary system for the nomination of public officials.

In favor of democracy it is generally held. That the people are the best guardians of their own interests and that democracy is, therefore, the surest guarantee of civil liberty; that participation in the government is to the best interest of the individual, bringing with it the discipline of responsibility; that it carries with it the safeguard of publicity, the public interests being protected by incessant watchfulness and public criticism; that the people obey more willingly laws in the making of which they themselves have had a share; that it makes for a higher type of patriotism.

The principal objections to democracy are enumerated by Bryce in his *American Commonwealth*. They include: Weakness in emergencies and an incapacity to act with promptitude and decision; fickleness and instability, with frequent changes of opinion and consequent changes in the conduct of affairs and in executive officials' insubordination, internal dissension, and disregard of authority; a desire to level down and an intolerance of greatness; tyranny of the majority over the minority; a passion for changing customs and for destroying old institutions; the growth of the demagogue, playing on the passions and selfishness of the masses, and too often replacing the true statesman in the regard and esteem of the people.

The Great War (1914-18) and World War II (1939-), representing a conflict between two theories of government—that of modern democracy and that of modern autocracy—have tremendously influenced democratic ideals. More and more democracy has come to mean not so much merely a form of popular government as the spirit of which that government is a manifestation. Less and less men are limiting it to a single state, more and more they are realizing its significance in international relationships and world affairs.

See CONSTITUTION; GOVERNMENT; REPRESENTATION; ELECTIONS; STATE. Consult Sir T. E. May's *Democracy in Europe*; Motley's *Historic Progress of American Democracy*; Lecky's *Democracy and Liberty*; Giddings' *Democracy and Empire*; Hirsch's *Democracy v. Socialism*; Webb's *Industrial Democracy*;

Ostrogorski's *Democracy and the Organization of Political Parties*; Addams' *Democracy and Social Ethics*; Hobhouse's *Democracy and Reaction*; Woodrow Wilson's *The State*; Bryce's *The American Commonwealth* (2 vols., new ed., 1914); Gauss' *Democracy Today* (1917); *War Papers of the University of Chicago*; *State Papers* of Woodrow Wilson.

Democratic Party. During the greater part of the history of the United States, the fundamental political questions with respect to which party lines have been drawn have related to the distribution of powers between the Federal and the State governments, and to the extent to which government should be subjected to direct popular control. The party now known as Democratic has consistently defended the States' Rights view, and has advocated the widest extension of the suffrage and the highest degree of popular control of government. In particular campaigns other issues have been placed in the foreground, but these have usually been corollaries of the particularistic and popular principles. Such has been the traditional opposition to a protective tariff, to a large national debt and extensive military and naval establishments. Other issues not connected with the fundamental principles have been annexed as an incident of practical party policy. Thus before the Civil War the Democratic party was forced to adopt at least a passive tolerance of slavery in consequence of the fact that a large part of its strength lay in the slave States; for a similar reason it opposed the extension of suffrage to the blacks in 1868. In 1896, and again in 1900, political exigencies induced the party to embrace the advocacy of the free coinage of silver. There has always been a tendency, however, to return to fundamental principles, after a brief trial of the newer issues.

The germ of the Democratic party is to be found in the Anti-Federalists who opposed the adoption of a Federal constitution. To this moderate party was given the name of Republicans, about 1792. During the French Revolution extreme sympathizers with the new French Republic formed so-called 'democratic clubs,' and were eventually absorbed by the Republican party, which came to be known as the Democratic-Republican. In 1798 the fundamental Democratic principles were first clearly formulated by Jefferson and Madison in the Kentucky and Virginia Resolutions. The State governments were declared to be the basis of our system; wherever any doubt existed as to whether a specific power

belonged to the Federal Government or to the States, the presumption should always be in favor of the States.

In 1801 the Democratic party succeeded in carrying the presidency, and it remained in power for twenty-four years. The exigencies of administering the government in time of war caused the party to swerve somewhat from its fundamental principles. The centralizing branch of the party, later known as the 'Whigs,' split off in 1824 and elected John Quincy Adams President. In the following election the particularist branch, from about this time called the Democratic party, returned to power with Jackson as President. Under his able leadership a party organization was perfected by 1832 which has since remained intact.

With the exception of the years 1840-44 and 1848-52, the Democratic party remained in power until 1860. The party was composed of two main branches, the southern, which from the earliest time had been particularistic, and the western, whose chief political tenet was popular control of government. In 1860, the ill-advised attempt of the southern branch to force the party to commit itself to the extension of slavery resulted in its disruption. The influx of alien immigrants after the war further weakened the Democratic party, since most of the immigrants allied themselves with the Republicans as the party of freedom.

In an attempt to repair their fortunes the Democrats in 1872 endorsed the candidacy of Horace Greeley, Liberal Republican, and adopted the platform of the Liberal Republican party. They were defeated by an overwhelming majority, but the party had at last been disentangled from the slavery issue. In 1884, and again in 1892, Grover Cleveland was elected President upon a platform embodying the traditional Democratic principles, tariff reform being the principal issue. Cleveland was the last Democratic president until Woodrow Wilson was elected in 1912, there having been several splits in the party in the meantime. After Wilson's two terms the Democratic party failed to elect its candidate until 1932 when Franklin Delano Roosevelt received an overwhelming majority which was repeated in 1936, 1940, and 1944.

Democritus (460-370 B.C.), one of the great Greek philosophers. He propounded the theory, known as the atomic system, that nothing existed but atoms and empty space; that the atoms were in a state of perpetual motion; that differences of arrangement and

position of the atoms accounted for all varieties of substance and form. In ethics Democritus held that the end of life is a calm, unruffled cheerfulness. Hence, perhaps, he was known as the 'laughing philosopher'. Consult Zeller's *Pre-Socratic Schools* and J. Burnet's *Early Greek Philosophy*.

De Moivre, Abraham (1667-1754), French mathematician. In his chief work, *Miscellanea Analytica* (1730), he set forth the theorem known by his name. He also wrote *The Doctrine of Chances* (1718; 3d ed. 1756).

Demonetization, a term applied to the official withdrawal of a coin from circulation, and also to the abandonment of a metal as a standard of value. The term demonetization is often used to describe the closing of the mints to the free coinage of a metal.

Demonology is that branch of the science of religion which deals with the existence and nature of a supposed realm of spirits possessing powers for evil over men.

The first stage in the development of the idea of demons or spirits of evil is that known as *animism*, which is exemplified among negroes and others, and which gives birth to the magician and the witch-doctor. The demons are not worshipped; they are feared and hated and various means are resorted to, in order to avert their malevolence. In a further stage of development a process of differentiation sets in, the result of which is that there appear a small number of outstanding spirits, each with a distinct individuality. Among the most familiar of the great arch-demons may be mentioned the Seven Spirits of Evil in Assyrian mythology. In classical legend the endless tales of struggle, such as those of Zeus with Typhon, are typical of this stage.

At a still later stage the demon begins to assume the features of the devil; he appears as not merely physical but as moral evil. The completion of the process is monotheism coupled with monodemonism; the best examples being found in Judaism and Christianity, which set up Jahveh or God and Satan in almighty antagonism.

A special character was given to Christian demonology from the fact that Christian teachers insisted on the idea that the gods of their neighbors were demons who had usurped the place of the true God. Towards the close of the middle ages the demons all became devils. The marvellous tales of witches' Sabbaths, of men, women, and children possessed wholly or in part by the emissaries of Satan,

help to show up the serious side of this picture. It has, however, its lighter, even grotesque elements, absorbed from pagan religions, and including stories which depict Satan as a stupid character, and recount many jokes at his expense, stories which speak of him as lame, cloven-footed, possessive of horns and a tail; and folklore stories in which his followers appear more for amusement and human interest than for terror.

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De Morgan, William Frend (1839-1917), English novelist, started life as a painter, but gave up painting to make designs for stained glass. Then he devoted himself to ceramics until he was sixty-five. His first novel, *Joseph Vance*, 1906, met with extraordinary success. This was followed by *Alice-for-Short* (1907); *Somehow Good* (1908); *It Never Can Happen Again* (1909); *An Affair of Dishonor* (1910); an historical romance quite unlike his other works; *A Likely Story* (1912); *When Ghost Meets Ghost* (1914); *The Old Man's Youth*, published posthumously. De Morgan excels in naturalness of dialogue, and his writing has subtlety and delicacy well fused with robustness.

Demosthenes, Athenian orator and statesman, was born in or about 384 B.C. He studied rhetoric, struggling to overcome defects of speech and manner by practising before a mirror and by speaking with pebbles in his mouth. He also strengthened his voice by reciting on the seashore, and perfected his style by a prolonged study of the historian Thucydides. In 351 he began his denunciation of the aggressive policy of Philip of Macedon in a series of *Philippics*.

In 330 came Demosthenes' chief triumph as an orator, and perhaps also as a statesman in the eyes of his countrymen. Ctesiphon had proposed that his services to the state should be rewarded by the presentation of a golden crown, Æschines prosecuted

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Ctesiphon for certain illegalities in the proposal, and chiefly for describing Demosthenes as a public benefactor. The trial came on in 330, when Alexander's conquest of Asia made his supporters confident. But Demosthenes' oratory in his *chef d'œuvre*, the *De Corona*, won the day, and Æschines was banished. In 324 Demosthenes was implicated in the serious charge of having appropriated 20 talents, and confessed the act. He was fined 50 talents; and being unable to pay, he was imprisoned, but afterward escaped. A year or so later he was recalled, but finally, to avoid execution, he poisoned himself.

Demosthenes' energy and force of denunciation astonishes us when we remember how readily the Athenians resented attacks from orators, even punishing them with death. He has every rhetorical artifice at his command, and his speeches contain an almost unvarying observance of laws of rhythm and harmony. He does not disdain a familiar or vulgar word when it is the right word; at the same time his metaphors are most brilliant, and his tone elevated to the point of sublimity. He scorns the expedient, and points only to the path of glory and duty. Consult Plutarch's *Life*; also R. C. Jebb's *Attic Orators*; Schaefer's *Demosthenes und seine Zeit*; Blass' *Demosthenes*; Butcher's *Demosthenes*. The best English translation is that in Bohn's edition.

Demulcent, a term applied to medicines used to soothe irritated parts, particularly the mucous membranes of the mouth and throat. Olive oil, syrup, glycerine, and starch are examples.

Demurrage. The compensation paid to the owner of a ship for its detention by the charterer beyond the number of days allowed for loading and unloading, or, if no time is specified, beyond a reasonable time.

Demurrer. A pleading, the legal effect of which is to admit for the purpose of argument that the facts alleged in the pleading to which it is interposed are true, but which challenges its legal sufficiency on account of some defect. A demurrer, therefore, raises questions of law only, and the argument thereon is before the court without a jury. Most demurrers are interposed on the ground that the complaint does not state facts sufficient to constitute a cause of action. The facts are assumed to be admitted only for the purpose of argument of the demurrer, and the party interposing it is not estopped to deny them later. The legal insufficiency of the pleading demurred to must appear on its

face or the demurrer must be overruled. No proof as to the facts can be taken on a demurrer.

Denarius, the name of the chief silver coin of ancient Rome, referred to in the New Testament as 'a penny.' It was first minted in 269 B.C. In 217 B.C. it was valued at 16 asses (about 17 cents).

Denary Scale, the common scale of notation or number-naming.

Denatured Alcohol, a compound of alcohol manufactured for household uses, such as heating and lighting; for running internal combustion engines; for use, after being vaporized, in connection with mantels for automobile and locomotive headlights; and for many other industrial purposes. It must by law contain ten parts of wood or methyl alcohol and one-half of one part of benzine for every one hundred parts of alcohol. The government permits, when requested, the use of other substances.

Dendera, village of Upper Egypt, on the left bank of the Nile, celebrated for its ruined temple of Hathor, which is one of the most magnificent and best preserved of the antiquities of Egypt. It was begun under Ptolemy XIII. and finished under Tiberius. It measures 220 ft. in length by about 50 ft. in breadth, and has a noble portico or hypostyle hall supported on twenty-four columns. Hieroglyphics and figures cover the columns and walls. The tombs of the ancient princes of Dendera were discovered by Flinders Petrie in 1898. A famous table of zodiacal signs, discovered here in 1822, was removed to the Paris Museum.

Dendrite, in physiology, a protoplasmic process of a nerve cell, one of several which unite to form an axone or axis cylinder.

Dendrites, or **Dentritic Markings**, in geology, stains, usually black or brown, branching like the fronds of a fern, and most frequently found in the joints and at the division planes of rocks. They are due to the infiltration of solutions of iron and manganese into the cracks, where they have subsequently evaporated or crystallized out in these fantastic forms.

Dendrolagus, or **Tree Kangaroo**, a marsupial animal, living chiefly in trees, which somewhat resembles the kangaroo, but is smaller. Four species are known—three of them found in New Guinea, and the other in North Queensland, Australia. See KANGAROO.

Dendrophis, or **Tree Snake**, a genus of arboreal snakes, represented by nine species, which range from India to Australia. A

closely allied genus is *Dendrelaphus*. See SNAKES.

Deneen, Charles Samuel (1863-1940), American lawyer and executive, was born in Edwardsville, Ill. He was elected governor of Illinois for the term 1905-08, and re-elected for the term 1909-12. In 1925 he was appointed to fill the unexpired term of Senator McCormick, deceased, and was elected Senator for the term 1925-31.

Dengue, or **Breakbone Fever**, also called **Dandy** and **Bucket Fever**, a disease occurring almost exclusively in the tropics in regions subject to excessive moisture and particularly during the hot seasons. Dengue is mosquito borne, but the causative micro-organism has not yet been isolated. The disease was first accurately described by Brylton of Java, in 1779. Since that time there have been great epidemics in India (1824-5). It first appeared in America in the Southern States in 1827.

Denia, city and seaport, Spain, in the province of Alicante, on the Mediterranean; 45 miles northeast of Alicante. Founded by Phœnicians, and anciently called **HEMEROSCOPTON**, it was the refuge of Sertorius in his revolt against Rome (B.C. 81). In Moorish times it had 50,000 inhabitants. Phœnician, Roman, and mediæval ruins still exist; p. 12,600.

Denim, a strong twilled cotton fabric of superior wearing qualities. It is woven of single yarn in both warp and filling.

Denis, Saint (also **Denys** and **Dionysius**), the traditional apostle of France and first bishop of Paris. About 250 he was sent from Rome to preach the gospel to the Gauls; made numerous proselytes in Paris; was brought before the Roman governor with two other Christians; and was tortured, and afterward beheaded (272 or 290). In 636 King Dagobert founded on the spot an abbey, called St. Denis, which became the sepulchre of the French kings.

Denison, Henry Willard (1846-1914), American jurist, was born in Guildhall, Vt. From 1880 until his death was legal adviser to the Japanese Department of Foreign Affairs. He was the representative of Japan in drafting the treaty of peace with Russia at Portsmouth, N. H. (1905), and was a member of the Permanent Court of Arbitration of The Hague. He was decorated with various orders by the Mikado of Japan.

Denison University, a Baptist college founded at Granville, O., in 1831. For re-

cent statistics see Table under the heading COLLEGE.

Denizen, in Great Britain, an alien who has obtained certain of the rights of a British subject by letters patent, as distinguished from letters of naturalization. Abroad he enjoys the protection accorded to a British subject. In the United States, the term is applied to all naturalized citizens without distinction. See ALIEN.

Denizli, town, Asia Minor, in Smyrna vilayet, 53 miles southeast of Alashchr. In its vicinity are found the ruins of the ancient LAODICEA. In 1715 it was destroyed by earthquake; p. 20,000.

Denmark (Danish *Danmark*), the smallest of the three Scandinavian kingdoms. It is bounded on the n. by the Skagerrak and Kattegat; on the s. by the Baltic, Little Belt, and Holstein, the southern part of the former German province of Schleswig-Holstein; on the e. by the Kattegat, the Sound, and the Baltic; and on the w. by the North Sea.

Denmark proper consists of the Peninsula of Jutland and a group of islands in the Baltic, comprising Sjælland (Zealand), Fünen, Lalland (Laaland), Falster, Moën, Langeland, and others. It includes, also, the territory of Schleswig, formerly a district of the German province of Schleswig-Holstein, annexed to Denmark following the Great War, in accordance with a plebiscite held on Feb. 11, 1920 (see SCHLESWIG-HOLSTEIN). The area of Denmark proper is 16,570 square miles; the population of Denmark, 1937, was 3,749,000. Denmark gained over 150,000 in population by the return of Schleswig, in 1920, from German to Danish adherence, this being done in accordance with a plebiscite or choice of allegiance. The World Court at The Hague, April, 1933, recognized the sovereignty of Denmark over East Greenland.

The surface of Denmark is low and undulating. A ridge of low hills extends across the center of Jutland, but the highest point in the kingdom, Ejler Bavnehøj, about 565 ft., lies more to the n. near Skanderborg. The whole w. coast of the mainland is dangerous on account of its lack of harbors and its numerous sandbanks, the most perilous part of it being the Hornsrev, which extends for 23 miles. The Kattegat, with its shoals and rapid currents, is scarcely less dangerous. The eastern coast is much indented by bays, useful for navigation and valuable for their fisheries; and here and in the islands are many good harbors.

Both the continental portion and the islands are penetrated deeply by numerous fiords, the largest being Lim or Liim Fiord, which intersects Jutland, and has insulated the northern extremity of the peninsula since 1825, when it broke through the narrow isthmus which had separated it from the North Sea. The rivers, in view of the physical conformation of the land, are necessarily insignificant, except the Gudenaa in Jutland, which is 85 miles long. There are several important canals, however, including in Jutland works for the canalization of the Gudenaa, and of the Liim Fiord. Lakes abound in all parts of the kingdom, the most considerable being found in Zealand.

The climate of Denmark closely resembles that of Northern Germany. Jutland is the most inclement. The southern islands, on the other hand, have a comparatively mild and equable climate. Denmark is believed to have been anciently connected with the Scandinavian Peninsula and with Central Europe. The oldest formation is the Upper Cretaceous. The plant and animal life is similar to that of the plains of Central Europe. Beech and fir with some oak are found; while animals include the deer (in parks), fox, badger, and otter. The birds are chiefly water fowl of various kinds.

Until after the Reformation a great part of Jutland was covered with forests, the scant remains of which still exist. In 1866 the Danish Heath Society was formed to reclaim the Moorlands. On a part of the area, reforestation was begun with spruce and fir; and in forty years the forest area of Jutland was trebled. The Society, now receiving government aid, maintains over five hundred demonstration stations. The beech, which flourishes more luxuriantly in Denmark than in any other land, is almost universally predominant, although three centuries ago the oak, now comparatively rare, was the characteristic Danish tree. Peat, which is obtained in abundance from the bogs, brown coal or lignite, and seaweed generally take the place of wood as fuel.

Denmark is poor in minerals and is primarily an agricultural country. Eighty per cent. of its area is productive, and the percentage is increasing through the reclamation of the heath for crops and pasture. The country is divided for the most part into small farms averaging about 35 acres each. Coöperative societies have been organized in many branches of the agricultural industry. The chief crops are oats, potatoes, barley, rye and

wheat. Dairying is exceedingly important. The manufacturing industries have to do mainly with agricultural products, and Danish shipyards build most of the world's motor ships.

The state church is the Evangelistic Lutheran, introduced in 1536, of which the king must be a member. Complete religious toleration exists. Compulsory education has existed since 1814, and illiteracy is unknown. For higher education there are colleges of pharmacy and dentistry, the Royal Academy of Arts, the Polytechnic Institution, the military school, and the University of Copenhagen, open to both men and women.

The present constitution of Denmark adopted 1938, is founded on the 'Grundlov' (charter) of 1915, a further development of the 'Grundlov' of 1849. The executive power is vested in the king and his ministers, and the legislative power in the Rigsdag or Parliament. The Rigsdag consists of an upper chamber called the Landsting and a lower chamber called the Folkething. The privilege of voting is granted, with certain minor exceptions, to all citizens over 23 years of age. The Council of State consists of the ministers appointed by the king. For administrative purposes the country is divided into twenty-two counties, which are in turn divided into hundreds, and the hundreds into parishes. Copenhagen, the capital, forms a district with a special administration. The outlying possessions consist of the Färöe Islands, an integral part of the kingdom, Iceland, and Greenland. The islands of St. Croix, St. Thomas and St. John, known as the Virgin Islands, formerly belonged to Denmark but were sold to the United States in 1917 for \$25,000,000. (See GREENLAND, ICELAND.)

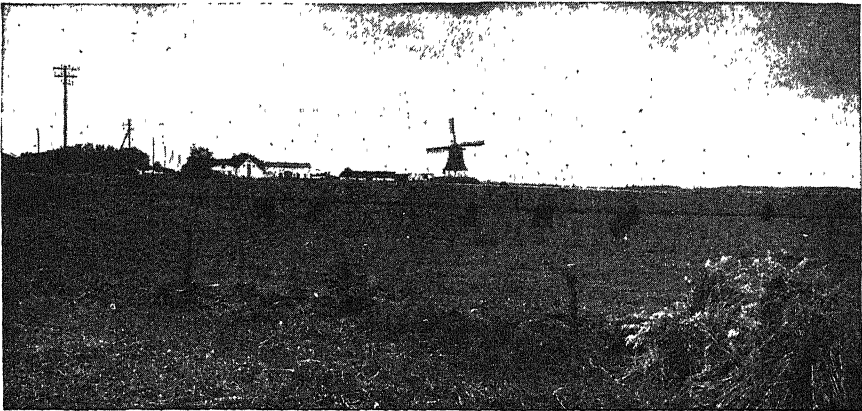
Service in the Danish army is compulsory for sixteen years, beginning at the age of twenty. The fleet is for coast defence only. Danish history emerges from the mythical with the establishment of the Norwegian (originally Swedish) dynasty of the Ynglinger in Jutland at the end of the eighth century. The Ynglinger were finally expelled from Jutland by Gorm the Old, who reunited the peninsula and the islands, and whose attempt to extirpate Christianity throughout his domains led to his subjugation by the German king Henry I. in 934, and to the conversion of the Danish monarchy into a German fief for two and a half centuries. Gorm's great-grandson, Canute the Great (1014-35), the conqueror of England, gave heathendom its final death blow; and Ca-

nute's nephew Sweyn (1047-76), after repelling the attacks of the Norwegian kings, founded in Denmark the dynasty of the Ulfinger, which lasted four hundred years. Valdemar I., called the Great (1157-82), conquered Rugen and won the overlordship of Norway. Canute VI. (1182-1201) forced the dukes of Pomerania and Mecklenburg to become his vassals; subdued Holstein and Hamburg; and refused to acknowledge German suzerainty.

Under Canute's successor, Valdemar II., called the Victorious (1202-41), Denmark was for a time the dominant power in Northern Europe. Finally his dominions extended from Lake Wener to the Elbe, and from Holstein to the Gulf of Riga. But this vast empire

the League, by the humiliating Peace of Stralsund (1370).

Valdemar IV. left behind him a daughter, Margaret, wife of the Norwegian king Haco. She acted as regent for her infant son Olaf till his death (1387), when she was proclaimed queen of both Denmark and Norway, her husband also having died in 1380. A year later she was elected queen of Sweden likewise. Subsequently, by the Union of Kalmar (1397), the childless queen persuaded the three kingdoms, while preserving their own separate laws and privileges, to coalesce into a single state. This political union proved to be injurious to all three kingdoms. Under Margaret's successors the strong separatist tendencies of Sweden constantly asserted



A Danish Landscape.

was of short duration; for in 1223 Valdemar was treacherously abducted by Count Henry of Schwerin, and held for three years in a German dungeon, whence he was able to emerge only by relinquishing all his conquests s. of the Eider. His subsequent attempt to recover his possessions was crushingly defeated at the Battle of Bornhövede (July 22, 1227). After the death of Valdemar II. a century of misrule ensued. It was Valdemar IV., called 'Atterdag' (1340-75), who saved the Danish monarchy from dissolution, and restored to it something of its former glory. Valdemar seized the island of Gothland and plundered (1361) the Hanseatic town of Wisby, then the largest and wealthiest emporium in the n., and thereby drew upon Denmark a long and bloody war with the cities of the Hanseatic League, which, after many vicissitudes, was terminated, greatly in favor of

themselves in popular risings, which finally resulted in the independent establishment of that kingdom under the Vasa dynasty. But it was Denmark and Norway which suffered most. Under the weak unionist kings all power passed gradually into the hands of the Danish nobles.

After the Reformation, Norway was little more than a Danish province, and her history till 1814 is absorbed in that of Denmark. The Reformation, moreover, had at first ruinous consequences in Denmark itself, and the post-Reformation period, the so-called *Adelsvæld*, or rule of the nobles (1523-1660), is from every point of view the darkest period of the country's history. The next kings, Frederick I. (1523-33) and Christian III. (1536-59), were occupied principally with domestic affairs; but Frederick II. (1559-88) and Christian IV. (1588-1648) aimed at a

more imperial policy, and for a time actually held the hegemony of the n. The latter even gained some advantages in a war with Sweden; but subsequently intervening in the Thirty Years' War, he was totally defeated by Tilly at Lutter (1626), and lost Holstein, Schleswig, and Jutland, which he only recovered by the Peace of Lübeck (1629), on engaging never again to interfere in German affairs. Moreover, Christian's ambiguous policy toward triumphant Sweden ultimately induced that power also to declare (1643) war against him, with the result that he was forced by the Peace of Brömsebro (1645) to cede to Queen Christina the provinces of Jemtland and Herjedal and the islands of Osel and Gothland.

Still more disastrous were the wars of Christian's successor, Frederick III. (1648-70), who by the treaties of Roskilde (1658) and Copenhagen (1660) was obliged to abandon to Sweden all the Danish provinces on the other side of the Sound. This catastrophe led to a singular domestic revolution as a result of which the king was offered absolute hereditary sovereignty and the old nobility was speedily submerged in a newly created court aristocracy of German origin. Thus began the period of *Enevæld* or absolutism in Denmark, which lasted for one hundred and eighty-eight years. The new, strongly centralized monarchy, guided by a succession of statesmen of great ability, soon made its influence felt in European politics. The first and greatest of these statesmen was Griffenfeld, who, under Frederick III.'s successor, Christian V. (1670-99), counselled an observant pan-Scandinavian policy.

Frederick IV. (1699-1730) placed the national finances on a sound basis, promoted trade and industry, and joined in the league against Charles XII. of Sweden in 1699. Very beneficial were the succeeding reigns of Christian VI. (1730-46) and Frederick V. (1746-66), owing chiefly to the administrative ability of Schulin and the elder Bernstorff. Education was promoted, commerce encouraged, and peace secured. The long reign of the imbecile Christian VII. (1766-1808) was a transitional period. In Dec. 1800, she joined the armed neutrality of the North. England sent a fleet to the Baltic, which on April 2, 1801, under Nelson and Parker, bombarded Copenhagen. By way of retaliation, Denmark refused to accede to the third general coalition against France in 1805; whereupon England in 1807 sent her navy into the Kattegat, and bombarded Copenhagen for three

days and carried off the whole Danish fleet. This act of violence threw Denmark completely into the arms of Napoleon.

The Peace of Kiel left Denmark an unimportant power of the third rank. The absolute monarchy had made shipwreck of the national greatness, and the demand for constitutional reforms grew loud and general, but despite an ever-increasing agitation, Christian VIII. (1839-48) steadily refused to grant his people a constitution. His successor, Frederick VII. (1848-63), however, by the Grundlov of June 5, 1849, abolished absolutism in Denmark, and shared his power with a Rigsdag or Parliament. The refusal of Denmark to grant Schleswig-Holstein a constitution of its own led to the German-Danish war of 1864, after which the Danes were compelled by the Treaty of Vienna to cede the duchies to Austria and Prussia.

In 1908 agreements of the European powers, to which Denmark was a party, guaranteed the preservation of the territorial *status quo* in the countries bordering the North and Baltic Seas. Christian IX. died in 1906, and was succeeded by his son Frederick VIII., who assumed the title, King of Denmark and Iceland. His reign was brought to an end by his sudden death in 1912, and Christian X., his son, ascended the throne. During the Great War (see EUROPE, GREAT WAR OF), Denmark joined with Norway and Sweden in maintaining a policy of neutrality and mutual protection of Scandinavian interests. In 1915 the constitution was amended to do away with certain property qualifications which had excluded the poorer classes from voting for members of the Landsting, and to extend to women the right to vote in parliamentary elections and eligibility to sit in the Folkething. In December, 1916, negotiations were completed whereby the Danish West Indies were sold to the United States for \$25,000,000 (see VIRGIN ISLANDS).

By the treaty of Versailles the German-Danish frontier was made subject to the wishes of the population. A plebiscite held in accordance with this provision (1920) restored the province of Schleswig to Denmark (see SCHLESWIG-HOLSTEIN). In the spring of 1940, Germany invaded Denmark. The Danes did not offer armed resistance and the Nazis controlled the entire country within a few hours. Consult Saxo Grammaticus' *Nine Books of Danish History*; Weitemeyer's *Denmark: Its History and Topography*; Brockner's *Danish Life in Town and Country*; Thompson's *Denmark*; Haggard's *Rural Den-*

mark and Its Lessons (1911), Gosse's *Two Visits to Denmark* (1911); Stefansson's *Denmark and Sweden* (1916); Desmond's *The Soul of Denmark* (1918); Howe's *Denmark: A Coöperative Commonwealth* (1922).

Denmark: Language and Literature.

The language of the Danes represents one division of the ancient Norse tongue, which was originally spoken throughout the whole of the Scandinavian n. Within itself it embraces three dialects—that of Skane (Scania), that of Sjælland (Zealand), and that of Jutland. Of these three it was the second which, after the fourteenth and fifteenth centuries, became gradually consolidated into the literary language of modern Denmark. While this process was going on, the language was all the time receiving a strong infiltration of German forms of speech, and it was not until the end of the eighteenth century that Danish began to assert its native vigor independently.

Danish literature is quite a late and modern growth with one notable exception. The exception is the collection of popular ballads known as the *Kæmpeviser*, of ancient but still somewhat doubtful origin, first written down about the middle of the fifteenth century. During the Middle Ages Latin was the literary language. The chief—indeed, the only memorable work written in that language—was the *Historia Danica* of Saxo Grammaticus in the twelfth century. In 1479 the University of Copenhagen was founded, and printing was introduced in 1490. The sweet hymn writer, Thomas Kingö (1634-1703), is the one original poet of this dreary period.

It was the genius of Holberg (1684-1754), who, however, was of Norwegian birth, which first gave Denmark a permanent place in the realm of letters. Holberg was distinguished in history, science, philosophy, and jurisprudence; but his principal service was the creation of a purely national drama. During the second half of the eighteenth century a great part was played by the literary societies or clubs, and by the critical reviews, chief among which were Rahbek's *Minerva* and *Den Danske Tilskuer*. It was then, too, that Suhm, following in the footsteps of Langebek, the founder of the Royal Danish Historical Society, wrote his voluminous though uncritical *Historie of Danmark*. The best poet of this period was Johan Ewald (1743-81), who produced some lyrics of exquisite beauty; while the Norwegian J. H. Wessels (1742-85) enriched the national literature with what is still its wittiest parody, the comedy *Kjerlighed uden Strømper*. But it was the ro-

mantic movement which really transformed Danish literature. It began with the epoch-making lectures of the young Norwegian Henrik Steffens (1773-1845), at Copenhagen. Conspicuous among his disciples was Adam Ohlenschläger (1779-1850), Denmark's greatest romantic poet, whose *Aladdin* marks the beginning of a new literary era.

The influence of romanticism began to wane during the second quarter of the nineteenth century. J. L. Heiberg (1791-1860) was the most prominent figure in Danish literature during the middle of that century. Modern Danish literature begins with Steen S. Blicher (1782-1848), who wrote sketches and stories, chiefly in the Jutland dialect. Fru Gyllembourg-Ehrensvärd (1773-1856), Heiberg's mother, may be regarded as the inventor of the realistic story in Danish. As an erotic poet the vivid and glowing Aarestrup (1800-56) is still unsurpassed; while Ploug (1813-94), Kaalund (1818-85), and Holst (1811-93) are all lyrists of high achievement. Even greater than they is Frederick Paludan-Müller (1809-76), whose versified satirical romance of *Adam Homo* is one of the masterpieces of the language.

Unique alike in genius and in character is the world-renowned Hans Andersen (1805-78); while in the eccentric and poetical Søren Kierkegaard (1813-55), a master in the use of dialectic, Denmark possessed one of the greatest and acutest of modern philosophers. Coming to still later times, we find, from 1871 to the end of the century, the influence of the distinguished critic Georg Brandes (1842), the Danish Sainte-Beuve, paramount. For many years every eminent Danish writer was either his pupil or his disciple—e.g., men like J. P. Jacobsen (1847-85), whose exquisite sensibility for style is shown in *Niels Lyhne* and other stories; Holger Drachmann (1846-1908), the best of Denmark's later lyrists; Henrik Pontoppidan (1857), the Danish George Eliot; Peter Nansen (1861); Carl Larsen (1860); Gustav Wied (1858), and several others.

In recent years a new romanticism, characterized by the mystic symbolism general in European literature, is supplanting the earlier materialism. At the head of the new school is the poet and novelist Johannes Jørgensen (1866). Of this newer school prominent names are Jakob Knudsen, writer of fiction, who died in 1917, and the dramatist Johanr Sigurjonsson and Henri Nathansen. Consult Boyesen's *Essays on Scandinavian Literature*; Christensen's *Haandbog i Dansk Literatur*;

Weitemeyer's *Denmark: Its Language and Literature*; Borchsenius' *Hovedværker i den Danske Literatur*; Gosse's *Studies in the Literature of Northern Europe*, and *Two Visits to Denmark, 1872, 1874* (1911); Jørgensen's *Geschichte der Dänischen Literatur* (1908).

Dennery, Adolphe Philippe (1811-99), French playwright, was born in Paris. From 1850 to 1870 he was the mainstay of melodrama, his principal contributions being *Les Deux Orphelines* (1874) and *Michel Strogoff* (1880). He also wrote the librettos of Gounod's *Faust* (1856) and Massenet's *Le Cid* (1885); and *Le Tour du Monde en 80 Jours* (1875).

Dennett, Fred (1863), American editor and public official, was born in Valparaiso, Chile. In 1898 he became secretary to the U. S. Senate Committee on Public Lands; in 1907 was appointed Assistant Commissioner of the General Land Office, and in 1908 was made Commissioner. He resigned in 1913.

Dennewitz, village, province of Brandenburg, Prussia; 40 miles southwest of Berlin. It is of historic interest as the scene of a famous battle (Sept. 6, 1813) between 70,000 French, Italians, Saxons, and Poles under Marshal Ney, and 45,000 Prussians under Generals Tauentzien and Bülow.

Dennie, Joseph (1768-1812), American journalist, was born in Boston, Mass. He edited from 1796 to 1799 the *Farmer's Museum* at Walpole, N. H. In 1800 he began the *Portfolio*, which he raised to the front rank of literary journals in a non-literary age.

Dennis, James Shepard (1842-1914), American clergyman, born in Newark, N. J. As a missionary he labored in Syria, and was principal and professor of the Theological Seminary at Beirut, Syria. Among his publications are: *Foreign Missions After a Century* (1893); *The New Horoscope of Missions* (1908); *The Modern Call of Missions* (1913).

Dennis, William Cullen (1878), American lawyer, was born in Richmond, Ind. From 1906 to 1910 he was assistant solicitor to the U. S. Department of State, and was the agent of the United States in the Venezuela arbitration (1909-1910), and the Chamizal boundary dispute with Mexico (1910-1911). In the Panama-Costa Rica boundary arbitration (1911-1914) he served as secretary to the Chief Justice of the United States.

Denny, Reginald Leigh (1891-) ac-

tor, born in Richmond, Surrey, England. He began his stage career as a child, playing in London and the provinces, came to the United States in 1912, played in stock companies, 1914-1917. He served with the Royal Air Force, Great Britain, during the World War, 1917-1919. He entered the motion pictures in 1919, in which he has been most successful.

Density expresses the concentration of matter in a substance. The *absolute density* is the mass of unit volume, while the *relative density* is the comparison of the mass of the substance with that of an equal volume of a standard kind of matter, which with solids or liquids is water at 4° C., or with gases, hydrogen at standard temperature and pressure. For methods of determination, see SPECIFIC GRAVITY; HYDROMETER; GASES.

Density of the Earth. See EARTH.

Densmore, Emmet (1837-1911), American inventor, was born in Blooming Valley, Pa. He assisted his brothers in the development and production of petroleum upon Oil Creek, Pa., and in inventing the first tank cars for shipping oil. He and his brother James then developed the first successful typewriter from the C. Latham Scholes machine, now known as the Remington. He was among the first to urge that fruit and nuts are the natural food of man. He wrote *Natural Food of Man* (1890), and other works on diet.

Dent-du-Midi, a summit of the Swiss Alps, 6 miles southwest of St. Maurice, near the French frontier. Altitude, 10,700 ft.

Dentex, or **Dentice**, a genus of fishes allied to the perches. One species (*D. vulgaris*) abounds in the Mediterranean. It is a voracious fish, with long, sharp teeth, and attains a large size.

Dentils, in classic architecture, though rare in Doric, are tooth-like projections on a small square band of the bed mouldings of the cornice.

Dentine, or **Ivory**, the principal constituent of mammalian teeth. See TEETH.

Dentistry, the science that concerns itself with the care of the human teeth and associated structures. While dentistry is a science distinct from that of medicine—a medical degree does not entitle one to practice dentistry in America—yet the medical aspect is important and is widely recognized. Dental practice may be considered under three main divisions: Oral surgery, operative dentistry, and prosthetic dentistry. Orthodontia, which

many regard as a department by itself, is usually included in the colleges in the department of prosthetic dentistry.

Operative Dentistry is conveniently treated under the subdivisions of prophylactic or preventive dentistry, and of remedial or reparative procedure.

Dental Prophylaxis primarily engages to cleanse the teeth and to prevent their destruction by decay or other pathological conditions. It includes the instruction of the patient in the proper methods whereby the mouth and teeth may be kept clean; the avoidance of dietetic or other indiscretions, which directly or indirectly injure the teeth; the adoption during the period of growth of a diet which supplies the mineral salts necessary for the calcification of the developing teeth; the precautions to be taken by workers engaged in occupations that are dangerous to the teeth and jaws; the necessity for medical and dental advice when the teeth are being injured by perverted secretions, or by medicines.

Scaling is a minor operation, whereby the accumulation of a substance termed 'tartar' is removed from the teeth. There are two kinds of tartar, salivary calculus and sanguinary calculus. The first is a deposit of lime salts upon the surfaces of the teeth, which is precipitated from the saliva. Sanguinary calculus, sometimes called serumal deposit, is a tartar that is produced by pathological conditions in the tissues directly surrounding the neck of the teeth and comes through the circulation of the blood. This tartar is the least noticeable but is by far the most dangerous.

Remedial Procedure is called for in numerous abnormal conditions, of which *caries*, or decay of the teeth, is by far the most frequent. Caries is brought about by the acids formed in the mouth by micro-organisms as the result of the fermentation of the *débris* of food, or from the decomposition of stale saliva or saliva of improper composition due to pathological conditions of the system. These acids dissolve the enamel covering of the tooth, and bacteria are admitted to the dentine, which softens and disintegrates under their action. If the caries is slight and superficial, excision of the carious part, followed by filling and polishing of the exposed sound tissue, is sometimes, though very seldom, sufficient. As a rule, having opened up the cavity, removed all the carious tissue, shaped the cavity according to requirement, and made it aseptic with suitable medica-

ments, the dentist proceeds to insert the filling, carefully excluding moisture during the process. The cavity should be so prepared as to fulfill requirements with regard to the position and surface angle to the margins of the filling, and to enable the filled tooth to offer the greatest possible resistance to pressure.

The most commonly used filling materials are gold; amalgam, made from silver, tin, copper and zinc; cements; gutta percha; combination fillings and porcelain. Fillings of all kinds, except cement, were formerly retained within tooth cavities by anchoring them mechanically in grooves, pits, or undercuts, cut for the purpose. By improved methods of baking porcelain, however, it has become possible to make a filling in one piece, which is then cemented into place. Gold inlays are made by a casting process in an entirely different manner from porcelain inlays. The tooth extractor was the first of the dental specialists. With the successful application (1844) of nitrous oxide gas as a general anæsthetic by Horace Wells, an American dentist, and with the discovery of ether by Jackson and Morton of Boston, Mass., at about the same time, and the introduction of chloroform by Simpson of Edinburgh in 1846, the painless extraction of teeth became possible. As advances were made in the study of bacteriology and of infection, it became recognized that the extraction of a tooth is not the simple operation it was long supposed to be, and today the extracting specialist is a true oral surgeon. Cocaine, eucaïne, and novocain and freezing by spray of chloride of ethyl are the principal local anæsthetics. For general anæsthesia, nitrous oxide gas with oxygen, ether, or chloroform is generally used. Nitrous oxide gas with oxygen may be used for quite extensive operations, and may be considered safer than either chloroform or ether. (See ANAESTHESIA.)

Prosthetic Dentistry includes the replacing of lost dental organs by artificial substitutes and the straightening of irregular teeth, called Orthodontia.

The construction of *Dentures* carrying artificial teeth is the everyday work of the dentist. Conditions in the Great War disclosed the fact that prosthetic work of an efficient type is more needed by the wounded than operative dentistry. Crowns may be made in many ways and of many materials. They fall into three classes—those which owe their hold on the root to a metal collar or

ferrule encircling the root, those which depend on a metal pin or dowel post fixed in the root canal, and those which depend upon both a metal pin and a metal collar. In Bridge Work, two or more roots or teeth between which toothless spaces exist are used as the piers of a gold bridge carrying artificial teeth. The province of Orthodontia is so to treat the teeth and jaws of young children as to force the teeth into proper alignment and cause the necessary development and growth of the bone. This secures the proper placing of the teeth in the dental arches so that they will meet in proper occlusion when the jaws are closed.

A great many of the most important processes are mainly due to American invention or development. Principal among these are the process of vulcanizing, the dental engine, the rubber dam, the introduction of nitrous-oxide gas. The electric motor has largely superseded the foot treadle for driving the dental engine; and electricity furnishes the motive power for many other mechanical devices of the dental office. The educational requirement for dental practice has gradually been advanced from a training that was largely technical to one consisting of the basic medical sciences—biology, chemistry and physics—as a part of a pre-dental academic college requirement, followed by extensive courses in the fundamentals of medicine—anatomy, histology, bio-chemistry, bacteriology and pathology. To these are added special studies of the dental and oral tissues, their diseases and treatment, including laboratory and clinical training in mechanical and technical procedures. Since 1917, four years have been required for the dental college course. The majority of universities confer the degree of D.D.S. (Doctor of Dental Surgery), while a few confer the degree of D.M.D. (Doctor of Dental Medicine).

Dental colleges established prior to 1900 were mostly under private ownership and many organized between 1880 and 1900 were operated as commercial enterprises. In 1867 Harvard University, by establishing a dental department, gave dentistry for the first time a definite educational status. In 1926 the Carnegie Foundation published a 692-page study of dental education in the United States and Canada, which served as an important stimulus toward university control. Dental practice is regulated by special laws in all civilized countries. The American Dental Association has about 35,000 members. There is an Association of American Dental

Colleges for the promotion of dental education, a National Dental Examiners' Association, to coördinate the work of the several state examining boards in the granting of licences to practice and to promote reciprocity between states.

Among the outstanding contributions of dentistry to human welfare the following are noteworthy: The discovery of anesthesia by the inhalation of nitrous oxide gas in



Burton Holmes, from Ewing Galloway.

Denver: Sixteenth Street, State Capitol in the Distance.

1844 by Horace Wells (1815-1848); the discovery of the anesthetic value of ether vapor in 1846 by William T. G. Morton (1819-1868); studies in the field of oral surgery by James E. Garretson (1869); studies in human and comparative dental anatomy by Sir John Thomas (1876); W. D. Miller's discovery that micro-organisms cause decay of the teeth (1883); while other important researches on decay of the teeth were those by Hieder and Weld (1869), by Leber and Rotenstein (1872-1877), and by E. Magitot (1878). G. V. Black (1836-1915) was me-

morialized as the 'Father of Modern Dentistry' by the American Dental Association in the inscription on a monument in Lincoln Park, Chicago, 1918. His scientific researches in anatomy, bacteriology and pathology revolutionized the practice of operative dentistry from 1895 to 1915.

Until comparatively recent years the practice of dentistry consisted for the most part in reparative service. As the vastly important health relationships of the dental field became more definitely recognized, methods of practice gradually changed, placing all technical service on a basis of preserving normal function of the oral tissues, while preventing those conditions which menace health. Some forms of dentistry seem to have been practised in ancient Egypt, Etruria, Greece, and Rome. In the Middle Ages the art made little progress, except among Arabian physicians. It was revived as a serious study in the 18th century, when Fauchard published *Le Chirurgien Dentiste* (1728). The literature on the subject was of slow growth; but in 1826 Koecher's *Principles of Dental Surgery* (London) established dentistry as a science.

In the United States, dentistry was introduced by a Frenchman named Le Mair, during the Revolutionary War; and about 1788 John Greenwood established himself in New York as the first American dentist. The birth of dentistry as a distinct profession may be dated from the incorporation in 1839 of the Baltimore College of Dental Surgery, the first dental college in the world. The first national dental association, known as the American Society of Dental Surgeons, was organized in New York City in 1840; and in 1855 the national convention of dentists was inaugurated. The pioneer dental periodical, the *American Journal of Dental Science*, was first issued in June, 1839. Controversy over painless dentistry was stirred by the discovery of what in some cases was an unusually effective anesthetic by Dr. Leroy L. Hartman. In 1942 the first American Orthodontic Congress was held at New Orleans, La. See the *Journal of the American Dental Association* and the *Journal of Oral Surgery*.

D'Entrecasteaux, group of British islands in the Pacific Ocean, lying to the north of the extreme east end of New Guinea, with which they are included for administrative purposes. The chief are Fergusson, Goodenough, and Normanby Islands. The total area of the group is 1,200 sq. m.

Denudation, in geology, the laying bare

of the rock formation by the removal of superficial matter as the result of erosion. It also signifies the process by which the earth's surface is broken up and the loose material carried away. The chief agents of denudation are: rain, which washes away the finer components of the soil, and dissolves some forms of rock; the heat of the sun, which expands rock to a point of disintegration; frost, which rends open rock seams in which moisture has collected; wind laden with sand, which abrades even the hardest cliffs; the rush of streams and rivers; glaciers, which grind, furrow, and smooth the rock over which they flow; and the sea, which is continually wearing away the rocks along the coast. Plants and animals also aid—the former by the expansive action of roots in rock crevices; the latter by borings, burrowing, etc.

The rate of denudation depends on the declivity of the ground, the nature of the subjacent rocks, and the rigor of the climate. Rivers like the Rhine, the Danube, the Elbe, and the Rhone are said to contain in every 6,000 parts by weight one part of dissolved mineral substance. See GEOLOGY; MOUNTAINS; RIVERS.

Denver, capital and largest city of Colorado, county seat of Denver co., is situated on both banks of the South Platte River. It lies on a level plain 5,280 ft. above sea level, beyond which rise the snow-capped peaks and deep blue shoulders of the Rocky Mountains. The climate is dry and equable, and the air clear and invigorating, with abundant sunshine. The exceptional climatic advantages and the high altitude have made the city a favorite resort for persons suffering with affections of the throat and lungs. Denver is in the midst of an important mining section, and adjacent to a rich agricultural irrigated country and vast grazing ranges.

Notable buildings include the State Capitol, St. John's Cathedral (Episcopal), the Court House, and the United States Mint. As the largest city between the Missouri River and the Pacific coast, Denver is an important distributing center, while its proximity to a rich mining and agricultural region has made it a leading industrial center. The chief industries are meat packing, smelting and refining, printing and publishing, foundries and machine shops, rolling-stock repairing, baking, and the manufacture of dairy products, flour and feed, lumber and timber, and brick and tile.

The city has a United States Custom

House, through which is imported about \$500,000 worth of goods annually, and a United States Assaying Mint. Consuls of ten of the leading nations have offices here. The neighborhood not only produces metals—lead, copper, iron, gold, and silver—but also coal, which has created a large smelting industry. Denver is governed by an elective mayor and council. The population is 322,412.

The site of Denver was settled in 1858 under the name of St. Charles, which was later changed to Denver. In 1859 a city government was organized, and in 1868 Denver became the capital of the Territory. Between 1894 and 1897 the towns of Barnum, Colfax, Harmon, and South Denver and the city of Highlands were added to Denver's area; in 1902 the city limits were extended to include Argo, Berkeley, Elyria, Globeville, Montclair and Valverde, and the city and county of Denver was chartered. A new charter was secured in 1904, providing for the acquisition of public utilities, and for the initiative, referendum, and recall.

Denver, University of, a co-educational institution in Denver, Colorado, was founded in 1864 by the Methodist-Episcopal Church as Colorado Seminary, and was reorganized under its present title in 1880. The University includes a College of Liberal Arts, Graduate School, Summer School, School of Law, School of Dentistry, School of Commerce, and Saturday College for Teachers. The Chamberlin Observatory contains one of the largest and best telescopes in the West. For latest statistics see Table of American Colleges and Universities under the heading UNIVERSITY.

Deoband, town, Saharanpur district, United Provinces, India; 45 m. n. of Meerut, much frequented by pilgrims on account of its numerous temples; p. 22,000.

Deodar, the common name of the Indian cedar (*Cedrus deodara*), a large and handsome tree attaining a height of 150 to 200 ft., found in Northwest India and the Himalayas. The timber is exceedingly valuable.

Deodar, feudatory state in Gujarat, Bombay, India. It consists mainly of a sandy, riverless plain, with an estimated area of 440 sq. m.; p. 25,000.

Deodorizers are substances employed for the purpose of absorbing or destroying the odoriferous principles evolved from decomposing matter. See ANTISEPTICS; DISINFECTANTS.

Deogarh, town, Santal Paraganas district, Bengal, India; 55 m. s.w. of Bhammur. It has a group of twenty-two Hindu temples dedicated to Siva, visited by pilgrims from all parts of India; p. 10,000.

Deoprayag, or **Devaprayaga**, a village of Tehri, United Provinces, India, at the junction of the Alaknanda and Bhagirathi Rivers; over 2,000 ft. above the sea. The magnificent temple of Raghunath is built on a lofty terrace, and the village is a favorite resort for Hindu pilgrims. The permanent population, chiefly Brahmins, is about 1,000.

Deoxidation, a term applied to the process of withdrawing the oxygen from a compound. Deoxidation may be carried on before the blowpipe, where the inner flame is essentially a deoxidizing one.

Department, in a political sense, a division of government, or territory. In the United States the term is used to designate the larger governmental divisions, as Department of State, Department of the Interior, etc., each under the direction of a Secretary, who is *ex officio* a member of the President's Cabinet. The term is also applied to subordinate divisions of the army organization, and to the territorial distribution of the army. In Great Britain the term department is applied to the subordinate divisions of the great branches of administrative offices, as the Bankruptcy Department of the Board of Trade. In France the term denotes a primary territorial division, practically equivalent to the States of the United States.

DePauw University, a Methodist-Episcopal college founded in 1837 at Greencastle, Ind., by the Indiana Conference. In 1884 its name was changed from the Indiana Asbury University in recognition of the munificence of Washington C. DePauw, who endowed it by his will. For latest statistics see table of American Colleges and Universities under the heading UNIVERSITY.

Dependent Children are normal children who require to be supported by other than their natural guardians. Insane, dumb, blind, or otherwise defective children are not included. There are two systems of caring for dependent children in general use, the orphan-asylum system and the placing-out system. The orphan-asylum system for the bringing up of children in institutions specially provided for them is the older and was for many years the one most generally followed in the United States. In the best and most progressive institutions efforts are made to overcome 'institutionalism' by

adopting the cottage system, which divides the children into small groups. Industrial schools for neglected children, some of them of a high order of excellence, exist in many cities.

The child-placing movement in the United States began in 1619, when the Mayor of London sent to the Virginia Company 100 children to be placed with 'honest and good masters,' but until the 19th century there was no organized plan of placing children in family homes, and there were no societies devoted to this specific work. The pioneer of the organized child-placing movement was Charles Loring Brace, who in 1853 organized the New York Children's Aid Society and began sending children to western homes. Since that date many of the States have instituted similar societies, Massachusetts having gone farther than any State in substituting the family home for the institution. In connection with this subject see also CHILDREN'S COURTS; FOUNDLING HOSPITALS; CHILDREN, LEGISLATION IN BEHALF OF; CHILDREN, DELINQUENT.

Depew, Chauncey Mitchell (1834-1928), American lawyer, railway manager, and public official, was born in Peekskill, N. Y. He became attorney for the New York Central and Hudson River Railroad in 1869. He was president of this road (1885-95), and was also prominent in various business, financial, and industrial enterprises. In early life he became interested in politics and soon became known as a public speaker and particularly as an after-dinner speaker, and held a conspicuous part in the Republican party. He was a member of the New York Assembly (1861-62), was Secretary of State of New York (1863-65), became a member of the United States Senate in 1899 and was re-elected in 1905.

De Peyster, Abraham (1658-1728), American merchant, son of Johannes De Peyster, was born in New Amsterdam, now New York City, where he followed his father's occupation of a merchant, in which he amassed a considerable fortune. He was mayor of New York from 1691 to 1695, and was afterward Chief Justice of the province. He was a member of the council under Cornbury, and as its president was acting governor in 1701.

De Peyster, Arent Schuyler (1736-1832), American soldier, grandson of Col. Abraham De Peyster, was born in New York City. At the outbreak of the Revolution he remained loyal to the king, and held impor-

tant commands in Upper Canada during that struggle.

De Peyster, Johannes (c. 1600-85), New Amsterdam settler, was born in Haarlem, Holland, and emigrated to America on account of religious persecution. He was the first of the New York family which bears his name.

De Peyster, John Watts (1821-1907), American soldier and author, was born in New York City. He published a large number of works, chiefly of a military and historical character. He inherited large wealth and made generous benefactions.

Depilatory, any substance or agent used for the removal of hair. A depilation is now often effected by electrolysis: a fine needle is inserted into the hair follicle and the root is permanently destroyed by the current.

Deposit, in law, a word used in a technical sense, implying the giving of possession of personal property by the owner or person entitled to possession, to some other person to hold for him, and subject to his direction as to re-delivery of possession. A 'deposit' of money in bank does not strictly come under the above definition, as the banker may mingle it with his own funds and is not obliged to return the identical money. See BAILMENT; PLEDGE.

Deposition, the written testimony of a witness taken before trial to be used at a trial. The use of depositions is limited to cases where the witness cannot be produced at the trial or where it would be difficult to produce him on account of age, illness or the like. The method of obtaining such testimony is strictly regulated by statute. In the United States courts it is provided for by an Act of Congress and most of the States have passed statutes upon the subject.

Deposition, in geology, the materials won from the surface of the land by wind, sun, rain, frost, and running water (see DENUDATION) which are swept into the sea, or into a lake, there to accumulate in the form of sedimentary and other deposits, which are finally converted into rocks, such as conglomerates, sandstones, shales, or limestones, and may be upheaved to form the substratum of new lands. Gravel and sand are the characteristic littoral or shore deposits, while fine mud will be carried farther out and will rest only where the depths are sufficiently great to ensure tranquillity by the absence of currents and waves. River water contains salts in solution, principally lime salts. These are abstracted by living organisms, such as moll-

usca and corals, which require them to build up their calcareous skeletons, and thus form calcareous deposits of organic origin as distinguished from the fragmental or 'clastic' sand and mud deposits. Great coral reefs are found in warm shallow water not contaminated by sediment.

There are also glacial deposits—the *débris* left behind by ice sheets and glaciers; saline deposits, laid down in salt lakes as the water evaporates; vegetable deposits, such as peat and coal; and deposits of volcanic ash and cinders. Wind deposits, called loess, are important; and those of the alluvial fan and flood plain types, known as continental deposits, are now believed to be extensively represented in earlier rock strata. Deep-sea deposits form a group apart. They are partly fine muds colored by ferruginous stains or by organic matter—the green muds, blue muds, red muds and volcanic muds found at depths of over 100 fathoms on the outer edges of the short platforms which fringe the coasts. Others are 'oozers' or fine-grained organic deposits, which may be calcareous or siliceous, and include globigerina ooze, radiolarian ooze, and diatom ooze.

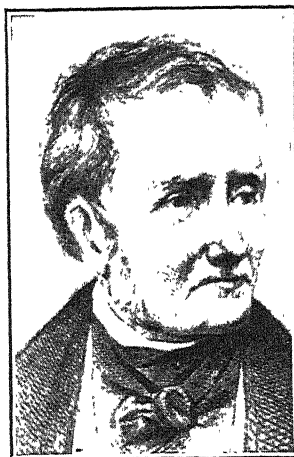
Red clay is a fine dark brown or red deposit which is found in every one of the oceans at the greatest depths. It covers more than half of the Pacific. Globigerina ooze is the principal deep-sea deposit of the Atlantic, red clay of the Pacific. For areas occupied by the various kinds of submarine deposits, as estimated by Sir John Murray of the *Challenger* Expedition, see table in the article OCEAN.

Deposition, Ecclesiastical, a term meaning deprivation of benefice and office, but not of orders, the term degradation being used for entire removal of clerical rights. In the United States deposition is effected by the various religious bodies, but practically means only exclusion from the pulpit of the particular denomination.

De Profundis, a name applied to the 130th Psalm because of the first two words in the Vulgate Version. It is one of the seven 'penitential psalms,' and in the Roman Catholic liturgy is sung when the bodies of the dead are committed to the grave.

De Quincey, Thomas (1785-1859), English essayist, was born in Manchester. In 1802 he ran away from school in Manchester, and wandered about Wales until discovered by his family and sent to Oxford, where he formed the opium habit, at first indulged in to deaden pain. In 1807 he became ac-

quainted with Coleridge, Southey, Wordsworth, Lamb, and Hazlitt, and in 1809 took a cottage at Grasmere, thus becoming one of the famous Lake coterie. For a brief period he edited the *Westmoreland Gazette*, and he also contributed to *Blackwood's Magazine* and other publications. In 1828 he left Cumberland, and settled first in Edinburgh, and afterward at Lasswade. The first of his writ-



. Thomas De Quincey.

ings to attract attention was the *Confessions of an Opium Eater*, published in 1821, in which he gives a charming sketch of his wanderings in Wales. But it is in his brilliant essays that he will really live. No reader of such papers as *The Vision of Sudden Death*, *The Avenger*, *Joan of Arc*, and the *English Mail Coach* can ever forget them. Very striking also are his historical speculations, such as *Judas Iscariot* and *The Roman Meals*; while his biographical and critical articles upon Shakespeare, Milton, Kant, Goldsmith, Wordsworth, and others, remain among the finest essays of the kind in the English language.

The best edition of the *Works* is that by Professor Masson (14 vols., 1889-90). Consult Page's *Life and Writings of De Quincey*; *De Quincey*, by David Masson, in the English Men of Letters Series (1881); Findlay's *Personal Recollections of Thomas De Quincey*; *De Quincey's Autobiography*, vol. i. (Masson's ed.); *De Quincey's Posthumous Works*, ed. by A. H. Japp (1893).

Derajat, a narrow alluvial strip of country between the Indus and the Suliman Moun-

tains, forming the s.w. division of the Punjab.

Derby, town, England, chief town of Derbyshire, on the Derwent river; 40 m. n.e. of Birmingham. The first successful silk mill in the kingdom was set up here in 1718, and the porcelain manufacture was established about the middle of the same century. Richardson the novelist and Herbert Spencer were born here; p. 129,836.

Derby, George Horatio (1823-61), American soldier and humorist, was born in Dedham, Mass. Assigned to the topographical corps, he carried out a number of surveys, and was promoted captain of engineers, and was in charge of the erection of light-houses on the Florida coast when he received the sunstroke from which he died. His humorous sketches, written over the name 'John Phoenix,' were widely popular.

Derby, Orville Adelbert (1851-1915), American geologist, was born in Kelloggsville, N. Y. He was chief of the geographical and geological surveys of São Paulo, Brazil, from 1886 to 1904, during which time he published the first topographical maps of South America founded on surveys.

Derbyshire, inland county, England, south of Yorkshire and north of Leicestershire. Its greatest length is 55 m., greatest breadth 34 m., and area 1,013 sq. m. The county is mountainous in the north, while to the northeast broken moorlands stretch to Yorkshire. The county is noted for its beautiful and romantic scenery. The eastern part of the county lies in the great Midland coal field. Agriculture is followed chiefly in the south. Derbyshire is rich in abbey ruins, fine churches, feudal castles, and manor-houses, Chatsworth, the seat of the dukes of Devonshire, and Haddon Hall, being especially famous; p. 757,332.

Derelict, a vessel or part of a vessel or its cargo abandoned at sea by the master and crew without the intention of returning to it or the hope of recovering it; or any other personal property abandoned or cast away on land or sea, or land uncovered by receding waters when the bed or course is changing. See SALVAGE; WRECK.

De Reszke, Edouard (1855-1917), Polish singer, was born in Warsaw. He early developed a splendid bass voice, and made his début at the Théâtre des Italiens in Paris as the King in *Aïda*, in 1876. Later he made many appearances in the United States with his brother, where they became general favorites.

De Reszke, Jean (1850-1925), Polish singer, brother of Edouard de Reszke, was born in Warsaw. He made his début as a baritone in *La Favorita* at Venice in 1874. He found, however, that his voice was a tenor and, retiring, he trained it for tenor parts, reappearing with great success at Madrid in 1879. He subsequently became a favorite in Europe and the United States. He retired from the stage in 1902 and devoted himself to teaching, in which he attained brilliant success.

Derg, lake, Ireland, in Counties Tipperary and Clare. It is really an expansion of the Shannon; 24 m. long and about 2 m. wide. It has many beautiful islands. The name is also given to an island-studded lake in County Donegal, Ireland, 6 m. long by 4 m. wide. Station Island, with the legendary cave of St. Patrick's Purgatory, used to attract thousands of visitors from all over Europe.

Dermatophyte, the general scientific term for those parasitic organisms which produce diseases of the skin, such as ringworm.

Dermestes, a genus of small beetles, the larvæ of which attack stuffed animals, zoölogical specimens, as well as meat and cheese. The bacon beetle and book-worm are common examples in storehouses, museums and libraries.

Dermoid Cyst, a new-growth or tumor found in various parts of the body except on the surface, and containing epidermal tissue elements derived from embryonic development. They are congenital, and sometimes grow to such a size as to necessitate an operation.

Dern, George Henry (1872-1936), Secretary of War, was born in Nebraska. He began mining in Utah in 1894, where he was an official in several mining companies. He invented, with T. P. Holt, the Holt-Dern ore roaster. He was vice-president and general manager of the Holt Christensen Process Co., and a director in various banks. He was governor of Utah 1925-32, and took office as Sec'y of War, 1933. He was the author of the Workmen's Compensation Law, etc.

Dernburg, Bernhard (1865-1937), German colonial official, was born in Berlin. He learned the banking business in New York City, was subsequently engaged in large banking and commercial interests in Germany, becoming known there as the German J. P. Morgan. He was director of the German colonial office in 1906-10. He made many visits to the United States.

Déroulède, Paul (1846-1914), French

public agitator and poet, was born in Paris. In 1898 he was a violent opponent of Dreyfus, and in 1900-05 was exiled from France for conspiring against the French government.

Derrick, a type of crane of universal use in building and general engineering contract operations. The essential part of the derrick is an inclined stick or 'boom,' pivoted at its foot for both vertical and lateral swinging, and held back at its upper end by rope tackle, which enables it to be raised to a steeper angle or lowered to a flatter angle. At the outer end of the boom is a sheave over which hangs a hoisting rope carrying a hook at its lower end. The rope leads back to a hand winch attached to the mast or to a hoisting-engine. The topping lift is operated by a second drum on the same engine. The derrick is 'swung' or rotated around its vertical axis by a horizontal wheel fixed at the base of the mast, around which passes a rope from the engine. A guy derrick has its guy-cables or other stays so placed that it can turn through a full circle.

Dervishes, or **Fakirs**, the name applied to a class of religious devotees in Mohammedan countries. There are two classes: those who belong to societies for religious exercises, whose tenets and oaths are secret; and those who belong to no sect but profess holiness and abstinence and wander solitary through the land. In Turkey there are thirty-two orders of dervishes, differing somewhat in practices and worship: the three principal orders are the Mevlevy, or Dancing Dervishes; the Bedevy, or Howling Dervishes; and the Rufai, who at the height of their frenzy, often seize red hot irons in their teeth and hack themselves with knives and swords.

Derwent, river, Tasmania, issues from Lake St. Clair, near the middle of the island, and after a southeasterly course of 130 m. falls into Storm Bay, a few miles below Hobart. It is navigable to New Norfolk, 21 m. n.w. of Hobart.

Derzhavin, Gabriel Romanovitch (1743-1816), Russian poet and public official, was born in the government of Novgorod. He was a favorite of Catherine II., whose achievements he celebrated in verse. His best known poem is *Bog*, an ode to God, which has been translated into many languages (English, 1861).

Descartes, René (1596-1650), whose name is Latinized as Cartesius, French philosopher, was born at La Haye in Touraine.

In 1637 his first published work appeared, *Discours de la Méthode* (Eng. trans 1899), accompanied by three scientific treatises as illustrations of the use of the method therein expounded. His *Méditationes de Prima Philosophia*, appeared in 1641, and a third work, *Principia Philosophiæ*, in 1644. The last of his chief published works, *Traité des Passions de l'Âme*, appeared in 1649. Descartes was the first widely influential thinker of modern times who sought to work out a philosophical system (Cartesianism) in independence of scholastic tradition and theological dogma. Seeking some indubitable and fundamental certainty, he found it in his famous 'Cogito, ergo sum' ('I think, therefore I am'), a proposition which expresses the inseparable connection of consciousness with existence, of thinking with a thinker. In mathematics Descartes was the founder of analytical geometry—i.e., the application of algebra to geometry.

Deschanel, Emile Auguste Etienne Martin (1819-1904), French author, was born in Paris. He was appointed professor of rhetoric at Bourges, and later held the same office at Paris. For the republican tone of his *Catholicisme et Socialisme* (1850), he lost his professorship and was banished. In 1881, having returned to France, he was appointed professor of modern languages at the Collège de France. He is the author of *Les Courtisanes Grecques* (1854), *Benjamin Franklin* (1882), *Le Romantisme des Classiques* (1882), *Racine* (1884), and various editions of French classics.

Deschanel, Paul Eugene Louis (1856-1922), French statesman, son of Emile Deschanel, was born in Brussels. From 1905 to 1909 he was president of the Parliamentary Commission of Foreign Affairs and Colonies. He was president of the Chamber of Deputies, succeeding M. Brisson from 1912 to 1920, when he was chosen president of the French Republic, defeating M. Clemenceau by a large majority. He was a member of the French Academy and the author of *La Question du Tonkin* (1883), *L'organisation de la Démocratie* (1910), *Madame de Sévigné* (1911), *Lamartine* (1913), etc.

Des Chuats, river, Oregon, rises on the e. side of the Cascade Range, flows n.e., and after a course of 320 m. falls into the Columbia, 12 m. above The Dalles.

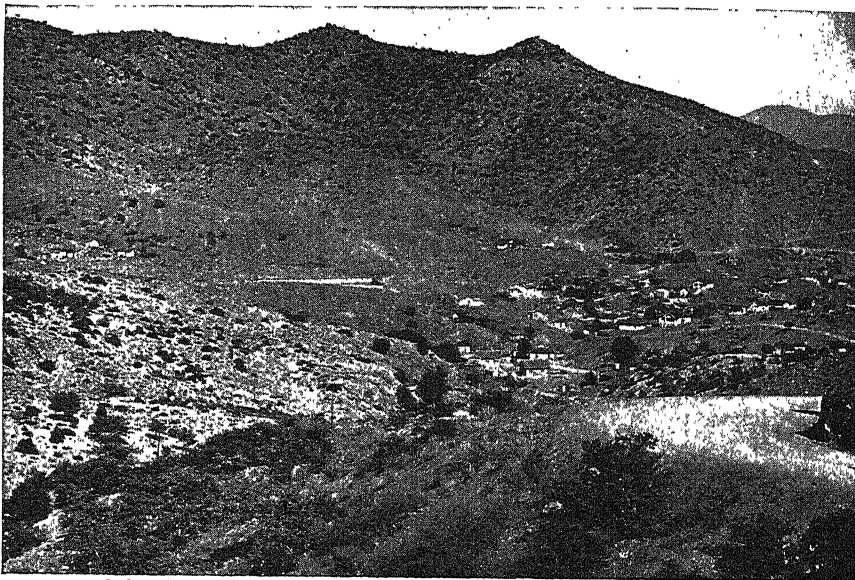
Desert, generally defined as a region approximately destitute of vegetation, properly includes the icy deserts of the polar (see **TUNDRA**) and high mountain regions as well

as the hot, arid wastes of lower latitudes. It is convenient, however, to restrict the term to the latter, which are caused by want of rain. The line of 10 inches annual rainfall within 50° of the equator may be taken as roughly bounding the outer limit of desert conditions, and the 5-inch line as the margin of the desert.

The desert climate is exceptionally extreme, as there is little or no water vapor or cloud to screen the surface from insolation or radiation. In consequence of the marked periodical changes in atmospheric density,

In the deserts of Arizona and New Mexico occur the giant cactus, the cholla, the palo verde, the ocotillo, the barrel cactus, the prickly pear, and the mesquite.

Animal life is restricted both in variety and in the number of individuals. The camel has for centuries been the favored beast of burden for conducting traffic across the arid deserts of the East. In the Turkestan desert, irrigation has been practised for thousands of years, and on the oases flourishing cities, such as Bokhara, are of unknown antiquity. In the Sahara and Arabian Deserts the in-



Photograph by Ewing Galloway.

Arizona Desert.

desert regions are most effective in producing land and sea breezes and monsoon winds. The dreaded sand storm or simoom is a kind of tornado or whirlwind which raises the sand in tall, rotating columns, sweeping over the surface with tremendous velocity. Desert vegetation is specially adapted to the climatic conditions of extremes of temperature and great aridity, being extremely scanty, and consisting mainly of hard, prickly plants of the cactus, euphorbia, and spinifex kinds, whose glazed surfaces exhale little of the hardly won moisture. Plantless areas are comparatively few, and occur only among the moving sand dunes or in the dry stony plains. Sage brush grows extensively on the dry alkaline plains of the Western United

habitants are either settled on the oases or lead a nomadic life (see OASIS).

The most important deserts of the western continent are those in the southwestern part of the United States and in Northern Chile. No desert region of any importance occurs in Europe, but in Asia and Africa there are extensive desert areas, and in the central part of Australia vast stretches of desert land occur. For a description of special desert regions see COLORADO DESERT; GOBI DESERT; SAHARA.

Desertion, in law, the wilful abandonment of a wife by her husband, or of a husband by his wife. It is an actual abandonment of matrimonial cohabitation, wherein the intention to desert is wilful and maliciously

persisted in without cause for a certain length of time Desertion constitutes a ground for an action to obtain legal separation or, as in Scotland and many of the States of the United States, it may be a cause for absolute divorce. The period of time necessary to make desertion a ground of divorce varies from one to five years in different jurisdictions. See ABANDONMENT; DIVORCE; HUSBAND AND WIFE.

Desertion, the act of abandoning the military or naval service without receiving a formal discharge. When a person subject to military law absents himself without authority, he is dropped as a deserter, if, in the opinion of his commanding officer, the circumstances attending the unauthorized absence warrant such action. The Articles of War now in force (1922) prescribe that any person subject to military law, who deserts or attempts to desert the service of the United States, shall, if the offense is committed in time of war, suffer death or such other punishment as a court martial may direct; and in time of peace, any punishment other than death that a court martial may direct.

The rights of citizenship are no longer forfeited by conviction of desertion in time of peace, but this penalty follows upon the commission of the offense in time of war. In the U. S. Navy, any absence without leave for more than ten days constitutes desertion, and penalties for this offense are approximately the same as in the U. S. Army. If a member of the crew of a merchant vessel deserts his ship before the expiration of his contract, he may be arrested and imprisoned for a period not exceeding three months, or until the departure of the ship from port, and must forfeit all money due him and all effects he may have left on board. Absence without leave for forty-eight hours is considered evidence of desertion.

Deshima, a small island connected with the city of Nagasaki, Japan, by a single stone bridge. Between 1641 and 1858 it was the restricted home of the Dutch representatives of the East India Company. It was practically a prison and the residents were subjected to many humiliations, but they enjoyed the European monopoly of Japanese trade.

Desiccation, the process of removing water from substances by making the vapor pressure of the water in the substance greater than that of the surrounding atmosphere. This may be done either by heating the substance, whereby its vapor pressure is increased, or by reducing the vapor pressure

in the space wherein the substance is contained. Desiccation, or dehydration, has long served as an important method of food preservation (see FOODS, PRESERVED).

Desiderio da Settignano (1428-64), Italian sculptor, was born in Settignano, the son of a stone mason. He is considered one of the leading sculptors of the early Renaissance, his technique and the naturalism of his figures reflecting the influence of Donatello, who is believed to have been his teacher. The beautiful marble tomb of Carlo Marsuppini (1455) in the Church of Santa Croce, Florence, is his masterpiece.

Desiderius (756-774), the last king of the Lombards; taken prisoner at the time Charlemagne invaded his territory and captured its capital, (774)

Design, an arrangement (planned) of forms, colors, spaces, material elements, successive impressions, or related actions. Although we commonly use the terms decorative design, textile design, furniture design, dress design, we also speak of an architect's plan, or of machine design, bridge design, boat design or the design of the structural steel of a building. To be excellent, a design must fulfill all of the ends for which it is devised. In architecture, a plan must be arranged for convenience; yet so as to produce a beautiful building, and this without waste of material. In industrial art, lines and shapes must unite in a good composition, colors must harmonize, yet the forms be suited to the material of which the article is to be made, and, above all, the whole carefully adapted to the use to which it is destined.

In their simplest aspect, that of mere arrangement, decorative designs may be separated into two classes, the first including designs in the flat and surface designs, the second those of form. Surface designs are often used to beautify designs of form, in which case it is a fundamental condition that the characteristics of surface lines be in harmony with those of the form to which they are applied. Decorative designs may also be divided, according to another classification derived from the measure in which they represent objects, into geometrical designs, conventional designs, and naturalistic designs. Many artists prefer the first two to the third because too exact portraiture of an extraneous object detracts from the individuality of the object that is being decorated. The predominant characteristics of different countries and periods are likely to show a

general bias either toward the conventional or the naturalistic.

The designs of past periods show marked family characteristics. When these characteristics are the result of the impress of the personality of a particular man or group of men, or people, they are sometimes referred to as belonging to the school of the man, men or people, as the School of Wm. Morris, the pre-Raphaelite School, or the Flemish School. The laws of composition govern decorative design from the technical point of view. A design may be (1) a unit or single complete composition, in which case it must have one main focal point or climax, or at most two, toward which all other parts of the design must lead, or (2) it may be of a repetitive character, like wall paper, the running ornament of a frieze or the diaper pattern. While each part of a composition must eventually lead to the climax or focal point, successive parts must contrast one with the other and for full effect the climax must always have its background. In a large design there may be minor focal points which in turn lead to the principal focal point. See ARCHITECTURE.

Desire, a condition of consciousness characterized by a longing or craving for some object mentally presented or represented. Desire is distinguished from impulse by its intellectual quality: that is, by the fact that it always has reference to a presentation or pictured object. It also implies lack of satisfaction of the impulse upon which it rests; the object, furthermore, which excites desire must be contemplated as standing in some relation to the person desiring it. The nature of desire has been treated rather vaguely by most psychologists, some classing it with feeling and emotion, others with volition or will.

Desmids, a group of single-celled freshwater alga, closely related to diatoms.

Des Moines, capital and largest city of Iowa, and county seat of Polk co., is situated on the Des Moines River. The principal public buildings are the State Capitol, State Historical Building, U. S. Government Building, Coliseum, Municipal Court, Auditorium, and Public Library. Colleges and schools include Drake University, Des Moines University, Grand View College (Danish Lutheran), Still College of Osteopathy, and others. The leading industries are printing and publishing, the manufacture of bread and bakery products, butter, confectionery and ice-cream, flour-mill and grist-mill products, patent medicines.

lumber, stoves and hot-air furnaces, brick and tile products, foundry and machine-shop products, and fur goods. Fort Des Moines was established in 1843, in order to guarantee government protection to the Sac and Fox Indians. In 1846 emigrants from Ohio, Indiana, Kentucky, and Missouri settled there, and in 1851 the town of Fort Des Moines was incorporated. In 1857 it received a city charter under its present name, and replaced Iowa City as the State capital; p. 159,819.

Des Moines River, the most important waterway of Iowa. The w. fork rises in Southwestern Minnesota, and is joined in Humboldt co., Iowa, by the e. fork, which flows from Okamanpadu Lake in Northern Iowa. The river then flows s.e. through Iowa, joining the Mississippi near Keokuk. It is 550 m. in length and has a drainage area of 14,500 m.

Des Moines University, a co-educational institution under Baptist control, located in Des Moines, Iowa, where it was established in 1865. For recent statistics see Table of American Colleges and Universities under the heading UNIVERSITY.

Desmoulins, Lucie Simplicie Camille Benoit (1760-94), French revolutionist, was born in Guise, Picardy. On July 12, 1789, he harangued the people on the dismissal of Necker, and instigated that pillage of arms which prepared the way for the destruction of the Bastille on July 14. On July 18 his brilliant pamphlet *La France libre* appeared, followed shortly after by the *Discours de la lanterne aux Parisiens*, by which he earned the soubriquet 'Attorney-General to the Lantern.' An ardent hero worshipper, Desmoulins associated himself first with Mirabeau and later with Danton. He was elected to the National Convention which followed the march of the mob on the Tuileries (Aug. 10), and voted, with the party of the 'Mountain,' for the death of the king. In May, 1793, urged on by Robespierre, he published his truculent *Histoire des Brissotins*. On the night of March 30, 1794, he was arrested with Danton and was guillotined a week later. Consult Carlyle's *French Revolution*.

Desna, a river of Russia, an affluent of the Dnieper. It rises in the government of Smolensk and follows a southerly course for a distance of more than 600 m., being navigable to Briansk in Orel government. It has a drainage area of approximately 33,500 sq.m.

De Soto, Hernando, or **Fernando** (c. 1496-1542), Spanish soldier and explorer, was born in Badajoz, Estremadura. In 1532 De Soto joined Pizarro, assisting in the conquest

of Peru. While in Spain (1536-7), he was made governor of Cuba, with authority to explore, conquer, and take possession of an ill-defined territory comprising the present Florida. To conquer this region, De Soto conducted his famous expedition of 1539-42, starting from Havana in May, 1539, and landing on the coast of the present Tampa Bay, Florida. After incredible hardships the expedition reached the mouth of the Red River where De Soto died in May, 1542. The survivors, about 300 in number, after wandering for a year in search of El Dorado, reached the Spanish colony at Panuco in September, 1543. Consult Irving's *Conquest of Florida by Hernando de Soto*; King's *De Soto and His Men in the Land of Florida*; Cunningham's *Graham's Life of Hernando de Soto*.

D'Esperrey, Franchet, French general. During the Great War (1914-18), he was in command of the First French Army Corps at the Battle of Chaileroi. On June 19, 1918, he became commander-in-chief of the Allied armies in the East, and on Sept. 16, 1918, opened the great offensive that forced the Bulgarian government to sue for peace. He represented the Allied governments in the armistice negotiations, signing the armistice with Bulgaria on Sept. 29, 1918 (see BULGARIA).

Des Plaines River, a river rising in Racine co., Wisconsin, and flowing in a southerly direction through Illinois until, in Grundy co., it unites with the Kankakee to form the Illinois River. It is 150 m. long, and is connected with Lake Michigan by the Chicago Drainage Canal. Its drainage area is 1,700 sq.m.

Des Planches, Baron Edmondo Mayor (1851-), Italian diplomat, was born in Turin, Italy. He served as Ambassador to the United States (1901-1910). His published works include: *Etudes sur la question d'Orient* (1876); *Attraverso gli Stati Uniti per l'Emigrazione Italiana* (1913).

Despoblado (Spanish 'desert'), a treeless, uninhabited plateau on the Bolivia-Argentine frontier; it has an elevation of about 10,000 ft.

Despotism, a state of government wherein all power resides in the ruler and the wishes of the governed have no part. Especially is the term applied to an oppressive and illegal rule.

Dessalines, Jean Jacques (1758-1806), a negro soldier of Haiti. He assumed the name of his French master, and saw service with the insurgent Toussaint l'Ouverture. When peace was made with France in 1802 he became a general of division but, again insurgent, he defeated Rochambeau at the battle of St. Marc. Upon the island declaring itself inde-

pendent, he was elected emperor under the name of Jean Jacques I. (1804). His cruelty and debauchery soon alienated his adherents, and he was killed by his officers Pétion and Christophe, the latter of whom became his successor.

Destinn, Kittel or Rittl, Emmy (1878-1930), Bohemian opera soprano, was born in Prague. She made her début in 1898, in the Royal Opera House, Berlin; sang the part of *Salome* in Berlin and Paris; and appeared in London in *Madame Butterfly*; was later a member of the Metropolitan Opera Company, New York City.

Destroyer, Torpedo Boat. This type of naval craft owes its origin to the idea, developed during the American Civil War, of damaging the underwater body of large men-of-war, by the explosion of a mine brought into physical contact with the hull of the ship. To meet the French menace of a large number of torpedo boats, the British, soon after 1890, began development of the 'destroyer,' a type which, by reason of being larger, earlier types were from 250 to 350 tons, was more seaworthy, carried a heavier battery of guns, and made higher speed, than torpedo boats, and hence could combat a greater number of the latter successfully. The destroyer, however, retained the essential characteristics of the torpedo boat. The value of destroyers, for use against both torpedo-boats and battleships, was recognized promptly by all the principal navies, and this type soon displaced the less efficient torpedo boats. Several influences have led to a continuous increase in the size of destroyers, up to nearly 2,100 tons; the great advance in the size and range of the automobile torpedo, which through the introduction of the superheater, has recently reached more than 15,000 yards; and the need of giving to the fleet of battleships an arm that is effective during darkness, also. This was possible by utilizing the torpedo. Previous to 1914 the major function of the destroyers accompanying a fleet was generally conceived to be the attack in force against hostile battleships, during nights just preceding and after the main day battle; though some leading authorities advocated the employment of these vessels principally in day attack while the opposing battleships were engaged. Effective employment of modern oil-burning destroyers in daylight action against powerfully gunned ships is facilitated greatly by their ability to lay dense 'smoke screens,' which may afford excellent cover from gun fire.

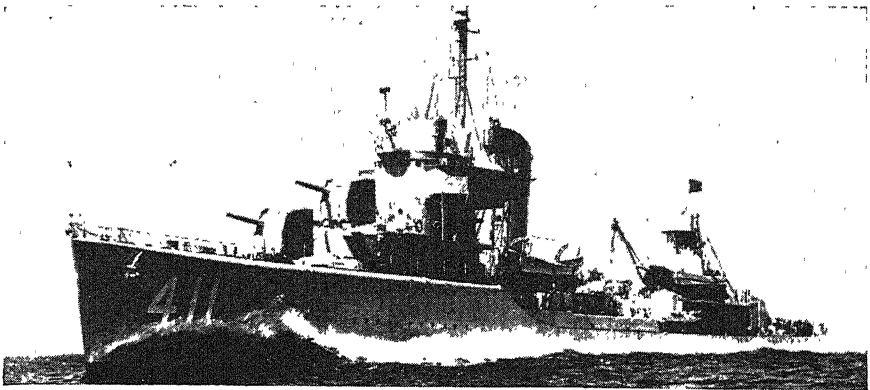
The destroyer is the most useful of all types

of men-of-war in meeting the various requirements of minor naval warfare. Its influence upon the outcome of a fleet battle is second only to that of the battleship. Due co-ordination between the efforts of battleships and destroyers is the most important element in modern naval battle. In the 1914-18 war the British brought out a type of super-destroyer, known as 'flotilla leaders,' which reached displacements exceeding 1,800 tons, and speeds of nearly 37 knots, while carrying guns as heavy as 4.7 inch. They were regarded as successful; though their size detracted from utility in night work. In June, 1940 the U. S. exchanged with Gt. Brit. 50 over-age destroyers for various naval and air-force bases. At the

tation for a homogeneous expression. Consult Muir's *Theory of Determinants*.

Determinism, name given to the view that every event in time, both psychic and physical, follows from a cause, and that, the cause being known, the event follows unvaryingly. It is opposed to indeterminism which maintains that temporal antecedents do not definitely determine events, particularly in the realm of the human volition. These opposing doctrines are of chief interest in the sphere of ethics, as determinism is generally assumed to be true of all events except those of volition. See WILL. Consult Palmer's *Problem of Freedom*.

Detmold, capital of the principality of



U. S. Navy—U. S. Destroyer, Anderson.

beginning of 1943 the U. S. had 164 destroyers and 193 were being built.

Detaille, Jean Baptiste Edouard (1848-1912), French military and historical painter, was born in Paris. During the Franco-Prussian War he acted as secretary to Generals Pajol and Appert, which gave him unique opportunities for a close study of the army. Among his best-known canvases are: *Skirmishing Near Paris* (1870; Vanderbilt collection, New York City); *The Conquerors*; *The Retreat*, which won for him the Legion of Honor; and the Metropolitan Museum of Art owns three of his pictures, one of which, the *Defence of Champigny* (1879), was regarded by the artist as his best work.

Detective Story, a story in which the element of mystery, usually connected with crime, predominates. The probable founder of the detective story was Edgar Allan Poe.

Determinants, in mathematical analysis, a system of symbols whereby many calculations are facilitated. It is really a concise no-

Lippe, Germany. The chief buildings are the old Castle, the modern Palace, Rathaus, and Theatre. There are manufactures of tobacco, buttons, labels, cloth, leather, furniture, and beer. Nearby is the gigantic statue of Arminius, chief of the Cherusci, who in the battle of the Teutoburger Wald annihilated the forces of the Roman Varus; p. 18,000.

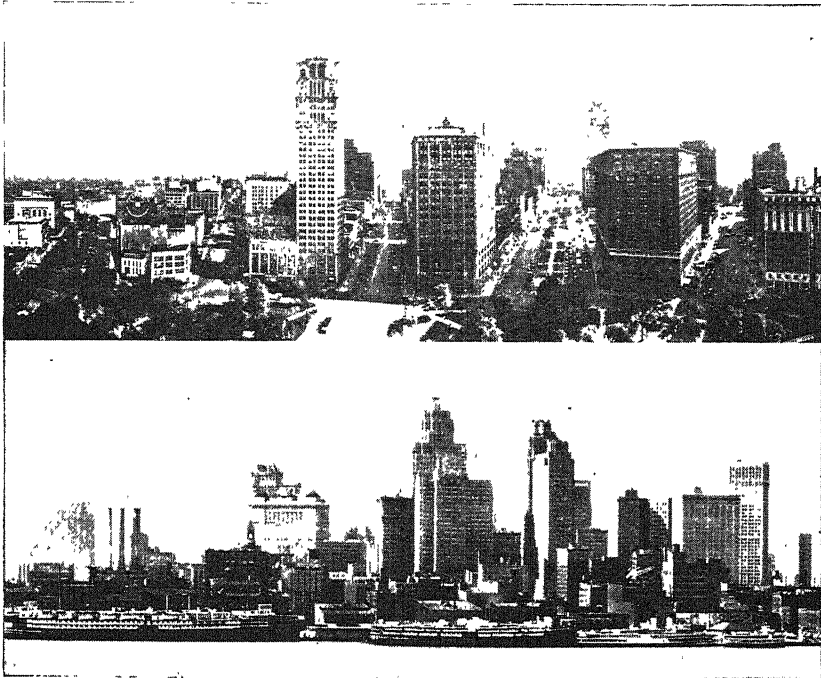
Detonator, a small charge of fulminate of mercury, which explodes with great violence, and sets off the explosive with which it is in contact. The fulminate of mercury, compressed in small copper tubes, forms the detonator proper, and is fired in its turn by a fuse, or by the passage of a current of electricity heating a fine wire to incandescence.

Detroit, metropolis of Michigan, a port of entry and county seat of Wayne co., is situated near the southeastern corner of the State, on the Detroit River, which forms part of the boundary line between the United States and Canada. A double tunnel under the Detroit River connects the city with Windsor, Can-

ada. The Detroit River, which varies in width from half a mile opposite the city to 3 m. near its entrance into Lake Erie, gives Detroit over 10 m. of navigable water front, and is of unique importance in the transmission of the vast volume of freight borne to and from the Great Lakes. Local steamship lines run to Buffalo, Cleveland, Port Huron, Mackinac, Sault Ste. Marie, and other ports on the Great Lakes.

Detroit's park and boulevard system comprises 1,566.73 acres, a part of the program to

Art contains the Scripps collection of paintings, and a valuable collection of East Indian, Japanese, and Chinese curios. The leading educational institutions are University of Detroit, Michigan College of Medicine and Surgery, Homeopathic College, Detroit Colleges of Law and Medicine, Academy of the Sacred Heart, and the city high and normal training schools. There are 123 public schools, and nearly the same number of parochial and private schools. Detroit is the largest exporting port on the Great Lakes, and has been espec-



The Skyline of Detroit, Metropolis of Michigan.

increase the acreage to 3,316 in the next few years. In addition to this, there are 50 acres for recreation, divided into numerous small playgrounds and a playfield. The valuation of the park and recreational land is approximately \$38,000,000. The park system includes Belle Isle (707 acres, valued at \$9,000,000), which has a fine horticultural building, the third largest aquarium in the world, zoological gardens covering 15 acres, and numerous canals and lakes spanned by ornamental bridges. Besides the public library, containing about 350,000 volumes, and a law library of over 10,000 volumes, the city has several libraries belonging to educational and religious institutions. The Museum of

ially busy in the automobile traffic since the European War. Manufactures are unusually varied and extensive, and have had a remarkably rapid growth. The automobile industry, starting in 1899, has increased the value and quantity of its output by huge percentages. The range of products is exceedingly varied, covering especially metal and wood products. Among the leading lines, besides automobiles and their parts, are the following: Adding machines, aluminum castings, bakery products, brass and bronze products, foundry and machine shop products, pharmaceutical preparations, printing and publishing, slaughtering and meat packing, soda ash and kindred alkalies, stoves and furnaces, and tobacco manu-

factures. The population of Detroit is 1,618,549.

The city is administered by a mayor and a common council of nine members, elected every two years, together with elected or appointed Boards of Estimate, Education, Health, Library Commissioners, and Poor Commissioners, and a City Plan Commission. The early French explorers in the New World visited the site of Detroit in 1670, and La Salle was there in 1679; but no permanent trading post and settlement was made until 1701, when the Sieur de la Motte Cadillac built Fort Ponchartrain. The latter became a contested point between England and France during the French and Indian War of 1755-63, and in 1760 it was captured by the English. It was nominally ceded to the United States by England in 1783. In 1802 Detroit was incorporated as a town by the legislature of the Northwest Territory. It was the capital of Michigan Territory from 1805 to 1837, and of the new State until 1847. On Aug. 16, 1812, it was captured by the British, but was evacuated on Sept. 29, 1813. In 1824 Detroit was incorporated as a city. Consult Parkman's *Conspiracy of Pontiac*; Farmer's *History of Detroit*; Burton's *Early Detroit*, and *The Building of Detroit*.

Detroit River, upon the bank of which stands the city of the same name, separates Michigan from Ontario, Canada. It is the strait through which the waters of Lake St. Clair and of the great upper lakes of the St. Lawrence flow into Lake Erie. It is about 28 m. in length, with a depth sufficient to float the largest vessels, and at Detroit forms an excellent harbor for shipping. It is said to carry more shipping than any other waterway in the world. See **DETROIT**.

Deucalion, son of Prometheus, plays the part of Noah in Greek legend. For the story, consult Ovid's *Metamorphoses*.

Deuterocanonical Books, those books of the Bible which are received by the Roman Catholic Church and regarded as constituting a second canon, of a later but no less equal authority than that of the first canon. These books are Tobit, Judith, Wisdom, Ecclesiasticus, Baruch, First and Second Maccabees and certain additions to Esther and Daniel in the Old Testament and the Epistle of St. Paul to the Hebrews, the Second Epistle of St. Peter, the Second and Third Epistles of St. John, the Epistles of St. James and of St. Jude, and the Apocalypse of St. John in the New Testament.

Deuteronomy, the 5th book of the Pen-

tateuch, is composed mainly of speeches of Moses.

Deutzia, a genus of flowering shrubs belonging to the Saxifragaceæ, native to Japan and China.

De Valera, Eamon (1882-), Irish politician, was born in New York City, son of a Spanish father and an Irish mother, was sent to Ireland when a child and educated there, graduating from the Royal University, Dublin. He took active part in the Easter rising, 1916, when he commanded a band of the Irish volunteers. Upon surrender, he received the death sentence, later commuted to life impris-



Eamon de Valera.

onment. By the general amnesty of June 15, 1917, he was released and at once became a leading figure in the reorganization of the Sinn Fein party which was closely associated with the Irish Republican Army. He was elected to Parliament from East Clare in 1917, and held that seat until the formation of the Irish Free State in 1922. The Sinn Fein convention elected him President of the Irish Republic in 1917, and he served as president of Sinn Fein from 1917-1925. He was arrested in 1918, but escaped, and fleeing to the U. S., he collected a large fund for the Revolutionary movement. Upon returning to Ireland

from the U. S. in 1921, he became chancellor of the National University of Ireland.

After opposing his colleagues, Arthur Griffith and Michael Collins in the compromise which resulted in the establishment of the Irish Free State in 1922, he became the leader of a new party, the Fianna Fail. In 1927, he took the oath of allegiance to the King and entered the Dail. In 1932 he was elected President. Under the 1937 constitution, the country became Eire; Douglas Hyde was Pres. and De Valera, Prime Minister, 1938.

Devanagari, the word for the Sanskrit alphabet, came into use about the end of the 18th century. The term now signifies the literary character used in the printing of Sanskrit, sacred and other books.

Devaprayaga, or **Deoprayag**, village, United Provinces, India, a favorite resort of Hindu pilgrims.

De Vere, Aubrey Thomas (1814-1902), Irish poet, son of Sir Aubrey de Vere, was born at Curragh Chase, County Limerick. He published *The Sisters; The Infant Bridal and Other Poems; Irish Odes, and Other Poems; Legends of St. Patrick*. Consult Brooke and Rolleston's *Treasury of Irish Poetry*.

Devil, The, in Christian theology, is the supreme impersonation of evil, and, as such, the supernatural arch-enemy of God and man.

Devil-fish, or **Eagle-ray**, a member of the family Myliobatidæ, or 'millstone rays,' so called from the peculiar nature of the teeth, which form a flat, tessellated pavement, and are used to crush the hard shells of the molluscs, etc., on which these fish feed.

Devil's Advocate. In the Roman Catholic Church, when it is proposed to canonize some saintly person, an inquiry is held, and in the process an accuser, named the *advocatus diaboli*, comes forward as objector, and severely criticizes the claim for canonization. An opponent defends the candidate's memory.

Devil's Island (Isle du Diable), off the coast of French Guiana, South America, used as a French prison. Dreyfus was imprisoned here in 1895.

De Vinne, Theodore Low (1828-1914), American printer, born at Stamford, Conn., and learned the printer's trade at the age of 14. He came to New York in 1849, entering the establishment of Francis Hart, whose partner he became 10 years later. Mr. Hart dying in 1877, Mr. De Vinne became head of the firm, whose title was changed to Theodore L. De Vinne & Co. in 1883. Mr. De Vinne probably contributed to the advancement of

printing in America to a greater extent than any man of his time. He published several works on the subject of printing, including *The Invention of Printing, Historic Types, and Title Pages*.

Devise. Real property left by will is called a devise, and the property so willed passes directly to the devisee without being administered.

Devonian, a geological system intermediate between the Silurian and the Carboniferous, named from the type locality Devonshire, England. The Devonian is most highly developed in the Appalachian region. The N. Y. section serves as the standard for America. Limestones prevail in the earlier formations and are succeeded by great thicknesses of shales and sandstones. The limestones are often very fossiliferous; some of them in Ohio and New York are vast reefs of corals and crinoids. The veins which traverse the kills of Cornwall, and the elvans and granites, are the chief deposits of tin stone in Britain. In Germany the Devonian yields lead, copper, and iron ores. The upper Devonian is the chief source of oil and gas in western Pennsylvania and southwestern New York. The life of the Devonian was characterized by great development of *Ferns, Lycopods*, and equisetaceæ among plants, and of aquatic vertebrates among animals.

Devonshire, maritime co. of England, between the English Channel on the s.e. and s. and the Bristol Channel on the n.w. The coast has several fine harbors; noted for its rich orchards and gardens. The manufactures include woolen goods, gloves, paper, lace, and leather. Fishing is carried on; p. 457,343.

De Vries, David Pieterszen, Dutch settler, sailed from Holland in May, 1632, with a small expedition to develop the settlement of Swaanendael, which had been established in the present State of Delaware, by Heyes and Hosset for agricultural and whale fishery purposes. After a stay of 18 months De Vries returned with his party to Holland; subsequently visited, on several occasions, the New Amsterdam settlement, where he attempted to establish himself on Staten Island and at Tappan on the Hudson. He published in 1655 an account of his voyages to different parts of the world.

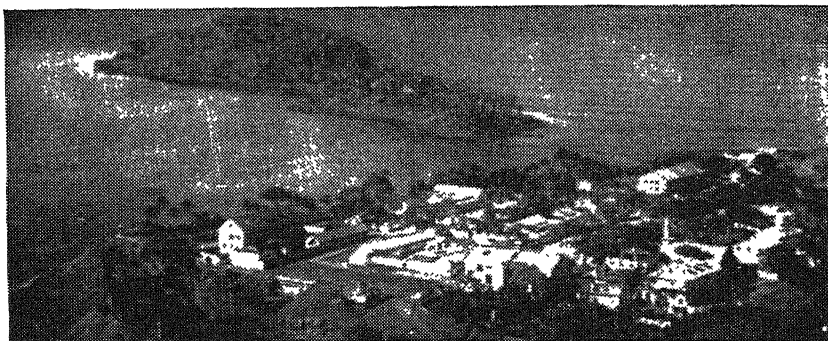
De Vries, Hugo (1848-1935), Dutch botanist, born Haarlem. In 1901 he published the first volume of his epoch-making work *Die Mutationstheorie*, in which he set forth his mutation theory. He has also published, in

English, *Species and Varieties: Their Origin by Mutation* (1905), and *Plant Breeding* (1907).

Dew, a deposit of water on the surface of the earth, formed when the water vapor in the air close to the ground or in the soil itself is condensed by the chilling influence of radiation. The conditions most favorable to dew formation are a relatively high humidity and a calm, clear atmosphere. With strong winds the air cannot remain sufficiently long in contact with the ground for precipitation to take place, and in cloudy weather radiation is checked. The dew point is the temperature at which the water vapor in the air condenses.

and which have a characteristic dew-like bloom.

De Wet, Christian Rudolf (1854-1922), Boer general and statesman, was born in the Smithfield district, Orange Free State; took part in the Boer War of 1880-1, and was successively commandant, general, and commander-in-chief of the Boer forces in the South African War, 1899-1902. De Wet signed the peace terms at Vereeniging in 1902; was appointed a member of the South African Council of Defence in 1912. Shortly after the outbreak of the Great War of Europe, General De Wet protested against the action of the South African Union in fighting Germany,



View of Devil's Island.

It depends upon the relative humidity of the air, and may be determined experimentally by the hygrometer or by filling a cup with water, adding ice, and stirring with a thermometer. The temperature at which moisture begins to form on the surface of the cup is the dew point of the air at that time.

Dewar, Sir James (1842-1923), British chemist and physicist. He carried out important investigations in the physiological action of light, spectroscopy, the liquefaction of gases, properties of matter at lowest temperatures, air calorimetry, and capillarity; was the first to obtain liquid, 1898, and solid hydrogen, 1899; and by evaporating liquid hydrogen under diminishing pressure secured the lowest steady temperature ever reached, 13 c. absolute. He was co-inventor, with Sir Frederick Abel, of cordite, and introduced the use of the Dewar or thermos flask.

Dewberry is distinguished from the common blackberry by its weaker and more prostrate glaucous stem, with scattered prickles, but without bristles or glandular hairs, also by the few large drupes, which make up its fruit,

and took the field against the British forces. He was captured and brought to trial on a charge of high treason, found guilty, and sentenced to 6 years' imprisonment and a fine of \$10,000; but was released in December, 1915. He is the author of *Three Years of War* (1902).

Dewey, Charles Melville (1849-1928), American painter, was born in Lowville, N. Y. His paintings include: *Edge of the Forest*; *Close of Day*; *The Gray Robe of Twilight*.

Dewey, George (1837-1917), American naval officer, was born in Montpelier, Vt. During the Civil War he served in the steam frigate *Mississippi* in the Gulf, taking part in the operations involved in the opening of the Mississippi and capture of New Orleans by Farragut, the capture of Port Hudson, the attacks on Fort Fisher, and others. He became a lieutenant-commander in 1865, and a commander in 1872; was commissioned captain in 1884; and commodore in 1896. In January, 1898, Commodore Dewey was given command of the Asiatic Squadron, and on the outbreak of the Spanish-American War was ordered to

proceed against the Spanish naval forces under Admiral Montojo. On May 1, 1898, he attacked and destroyed the Spanish fleet in Manila Bay (see MANILA BAY, BATTLE OF) without the loss of a man or material injury to any of his vessels; the Spanish navy yard at Cavite then fell into his hands. He remained in Manila Bay, blockading the port and vicinity until the arrival of American troops; then, in coöperation with General Merritt, he captured the city and adjacent fortifications. He retained command of the U. S. naval forces in Philippine waters until 1899, during



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Admiral Dewey.

which time he served as a member of the first Philippine Commission. In March, 1899, he was made Admiral of the Navy, the highest rank ever held by any American naval officer. From March 29, 1900, to the time of his death (Jan. 16, 1917) he was president of the General Board of Navy. His *Autobiography* has recently been published.

Dewey, John (1859), American educator and psychologist, was born in Burlington, Vt. He served successively as professor of philosophy at the Universities of Minnesota, Michigan, Chicago, and as director of the School of Education, University of Chicago (1902-04). Since 1904 he has been professor of philosophy at Columbia University. He has been a foremost leader in the United States in the reform of both educational theory and practice, and a prominent exponent of pragmatism. His published works include: *Influence of Darwin*

on Philosophy, and Other Essays (1910); *German Philosophy and Politics* (1915); *Democracy and Education* (1916); *The Public and Its Problems* (1927); *The Quest for Certainty* (1929); *Art As Experience* (1934).



John Dewey.

Dewey, Melvil (1851-1931), American librarian and library expert, was born in Adams Center, N. Y.; assisted in the formation of the American Library Association, started the *Library Journal*, and issued his *Decimal Classification* for libraries in 1876, which has been widely adopted.

Dewey, Thomas Edmund (1902-), American lawyer, was born and educated in Michigan, also a law graduate of Columbia University. Began practice of law in New York City, 1926. After serving as assistant district attorney, he made a notable record of crime convictions as special prosecutor, 1935-37; elected district attorney 1937. Jan. 1, 1943 he became gov. of N. Y. In 1944 he was Presidential candidate; defeated.

De Windt, Harry (1856-1933), English explorer and journalist, was born in Paris. In 1887 he journeyed by land from Peking to France, and from Russia to India in 1889, traversing Persia. He explored the Alaskan gold fields, travelled from Paris to New York by land, and travelled through the Balkan States, from Montenegro to Russia. Published: *From Peking to Calais by Land*; *From*

Paris to New York by Land; Through Savage Europe; My Restless Life; and other accounts of his travels.

Dewing, Thomas Wilmer (1851-1938), American painter, born in Boston. His works include: *Lady in Yellow*; *The Letter*; *The Recitation*; and many paintings in the Freer collection, Detroit.

Dextrin ($C_6H_{10}O_5$)ⁿ, a carbohydrate obtained along with sugars and similar bodies, by the action of heat, diastase, or mineral acids or starch. Commercial dextrin—which is also known as British gum—is prepared by heating starch to a temperature of from 200 to 250° c., or by first moistening it with dilute nitric acid and then heating to 170° c.

Dextrose, also known as **Glucose** and as **Grape Sugar**, one of the most important of the natural sugars, is a carbohydrate represented by the molecular formula $C_6H_{12}O_6$. It occurs, usually in company with fructose, in ripe fruits; in the seeds, leaves, roots, and blossoms of many of the higher plants; and in the urine in diabetes mellitus. It has been prepared synthetically by a complicated series of reactions, but is obtained practically by the hydrolysis of cane sugar, starch, or even cellulose, by heating with dilute acid. Commercial dextrose, commonly known as glucose, consists of a mixture of malt sugar, dextrin, and true dextrose. It is prepared principally from crude corn starch. Mixed with cane syrup, it is marketed as corn syrup, much used as a substitute for molasses.

Dey, a Turkish title of dignity, given to the governors of Algiers (before the French conquest), Tunis, and Tripoli.

Dezhnev Cape, or **East Cape**, the most easterly point of Asia, in the extreme n.e. of Siberia.

Dhar, feudatory state, Malwa, Central India; p. 170,000. The capital is Dhar; p. 18,000.

Dhârwar, capital of Dhârwar district, Bombay, India; exports raw cotton of fine staple; manufactures cotton and silk cloth; p. 30,000. The district has an area of 4,600 sq.m.; p. 1,113,000.

Dhaulagiri, or **Dhwalagiri**, peak of Nepal, India, one of the highest summits of the Himalayas. Alt. 26,826 ft.

Dhow, an Arab trading and slaving vessel much in use in the Arabian Sea and on the eastern coast of Africa.

Diabase, a group of basic igneous rocks included under the popular designation of 'greenstone,' and 'trap.' The essential constituents are plagioclase feldspar and augite, the latter occurring in broad, sharply angular

plates, enclosing the elongated crystals of feldspar. Two main types occur—Olivine Diabase, in which olivine is present, and Diabase proper, including epidiorite, proterobase, ophite, variolite, leucophyr, and numerous other varieties.

Diabetes, a disorder of the general system, of which the principal symptom is a greatly increased flow of urine. Diabetes Insipidus is a rare disease of uncertain etiology. Its principal features are a marked increase in the urinary output, extreme thirst, and a generally chronic course. Pituitary extract, administered subcutaneously, is useful in some cases.

Diabetes Mellitus is fundamentally a deficiency of the internal secretion of the islands of Langerhans of the pancreas (see PANCREAS), resulting in a metabolic disturbance which is manifested in an excess quantity of sugar in the blood (hyperglycemia) and in the urine (glycosuria). The disease is accompanied by great thirst, enormous appetite, emaciation, polyuria, and loss of strength. Diabetes mellitus of the typical severe form, unchecked by treatment, generally leads to death in coma within a few months in children and within one to three years in adults below the age of 40. Under treatment, patients with mild cases frequently pass a more or less normal existence.

Treatment is directed toward correction of the sugar metabolism, prevention of acidosis, and the establishment of a suitable maintenance diet. The discovery in 1921 of insulin by Banting and Best in the laboratory of McLeod, of Toronto, marked an epoch in the treatment of diabetes mellitus. Insulin is a potent extract of the islands of Langerhans, which, injected subcutaneously, alleviates the usual symptoms of diabetes. Unfortunately the effects are of brief duration and repeated injections are necessary. Consult the article on Diabetes Mellitus by Dr. F. M. Allen in *Nelson's Loose-Leaf Living Medicine*.

Diabolo, a game popular some years ago, which consisted in throwing up and rotating a spool, shaped like the old hour glass, and catching it on a string, when it is made to jump into the air again by a sudden tightening of the string.

Diagnosis, in medicine, the discrimination of diseases; through observation of symptoms, as changes chiefly functional, observed by the patient; and of physical diagnosis, or objective phenomena appreciable by the senses of the observer. The latter method has been much enlarged in scope by the modern methods in medicine of auscultation and percus-

sion, and also by the great advances made in physiological chemistry, and by the use of the microscope. See MEDICINE; SURGERY; ELECTRICITY IN MEDICINE AND SURGERY

Diagoras, surnamed the Atheist of Melos, a Greek philosopher and poet, driven from Athens on account of his atheism (411 B.C.).

Dial. See **Sun Dial**.

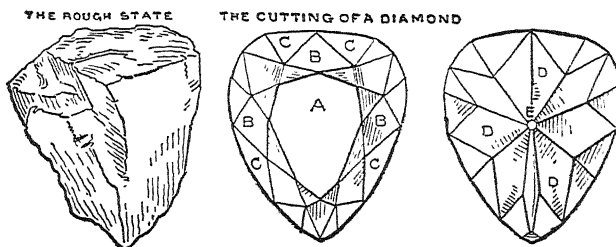
Dialect, in its most comprehensive sense, is applied to the ramifications of one main linguistic stem; but is generally held to denote some special divergence from the standard language of a country, restricted to a certain class or to the natives of a certain locality. The word is commonly used with reference to the idiom, vocabulary, and pronunciation of uncultivated people—mainly those living within various specified districts. See PHIL-
OLOGY; ENGLISH LANGUAGE

zer, in which it is separated from pure water by an animal membrane or parchment paper. See OSMOSIS.

Diamagnetism. Bodies such as bismuth, which, when placed in a field of magnetic force, tend to move from places of stronger to places of weaker force, are said to be diamagnetic. See MAGNETISM.

Diameter, in plane geometry, is generally a straight line bisecting any system of parallel chords of a conic section. In the circle, ellipse, and hyperbola, every diameter passes through the center of the curve, and is there bisected.

Diamond, an allotropic form of carbon, highly valued as a precious stone on account of its remarkable lustre; hardest of all known substances. The diamond occurs always in crystals (sp. gr. 3.52), which, however, may be rounded or irregular, especially when



The Cutting of a Diamond.

A, The table; B, the beasil; C, the girdle; D, the pavillion; E, the collet.

Dialectic is a technical term used in philosophy in several different senses. In ordinary speech the term means simply logical discussion, but it is apt to suggest cleverness in debate rather than soundness of reasoning.

Dialogue is the literary equivalent of conversation or speech between man and man, and may properly be extended to include soliloquy or monologue, which is practically speech addressed to the reader or the audience. The didactic dialogues of Plato illustrate a historic form of dialogue. Of the more eminent modern writers of the literary forms of dialogue, we may mention Lessing and Wieland among the Germans; Petrarch and Machiavelli in Italy; Fénelon and Diderot in France; and in England, Berkeley, Swift, and Landor.

Dialysis is the process of osmosis discovered by Thomas Graham, 1804-69, by which colloids, such as silicic acid or gelatine, can be separated from crystalloids, such as salt or hydrochloric acid, by dissolving them in water and putting the solution in a vessel, or *Dialy-*

found in gravels and sands. It belongs really to the tetrahedral class, though the usual form is the octahedron. On account of its hardness, the diamond can be ground and polished only with its own dust. The principal diamond fields are located in Brazil and South Africa; the stones are also known to occur in India, Borneo, British Guiana, Russia, China, Sumatra, and the United States. About 98 per cent. of the world's supply comes from the South African fields, the first of which was discovered in 1867. See PERIDOTTES.

In 1908 diamonds were discovered in German Southwest Africa, in a sandy coastal tract n. and s. of Lüderitzbucht. The diamonds occur in a superficial layer of gravelly sand, in some places heavily concentrated by wind action. There is reason for believing that they were originally derived from some volcanic rocks in the neighborhood of Pomona, and much work has been done to locate the mother lode. As the field now supplies 20 per cent. of the world's output, the discovery of the

original pipes is a matter of great interest.

The Brazilian diamonds usually surpass those of South Africa in hardness, but have little brilliancy, and, as a consequence, are chiefly used in diamond drills for mines, for making dies for fine wire drawing, and for other mechanical purposes. These diamonds for industrial purposes are usually called borts, carbons or carbonadoes. In the United States many diamonds have been found in the glacial drifts of the Great Lakes. The richest field is Arkansas, where several companies are at work. Small diamonds have been produced artificially by dissolving carbon in molten iron. See GEMS, ARTIFICIAL. Crystals of diamond have been discovered in meteorites found at Canyon Diablo in Arizona, in the Urals, and in Mexico.

The art of cutting and polishing diamonds centres in Amsterdam and London. See GEMS. The value of good stones depends on their weight and color. Red, blue, yellow, green, black, and colorless crystals are known. Blue and red stones are rare and valuable. Diamonds are weighed in carats (1 metric carat = 200 milligrams), and the value rises in proportion to the square of the weight.

The most valuable gems are usually owned by royal families or are treasured by governments as state jewels. One of the most celebrated diamonds is the *Koh-i-nur*, about 104 carats, now in the possession of the royal family of Great Britain. It was long the property of the rajahs of Malwa, and in 1665 was among the treasures of the Great Mogul. The *Koh-i-nur* is reputed to have once weighed 793 carats; but it has been cut and recut, always badly, to less than one-seventh that weight. See KOH-I-NUR. Another noted diamond is the *Orloff*, 194¾ carats, in the point of the Russian scepter. Some think that this and the *Koh-i-nur* are halves of the 'Great Mogul' diamond, described by Tavernier as having been seen by him in 1665 at the court of Aurungzebe. The *Regent* is another famous Indian diamond, preserved among the national jewels in Paris. The large *Sancy*, 53½ carats, is an historical diamond which was purchased about 1570 by M. de Sancy. It passed into the possession of Henry III. and Henry IV. of France, and was eventually sold to Queen Elizabeth of England.

One of the most celebrated is the *Hope* blue diamond, 44¾ carats, popularly supposed to bring ill luck to its owner. It was presumably cut from a larger stone purchased by Louis XIV.; was purchased by Thomas Henry Hope,

an English banker, and sold for \$180,000 to Mrs. E. E. McLean of Washington, D. C., in 1909. The *Excelsior*, the largest diamond known till 1905, was found in 1893 at Jagersfontein, Orange Free State. It was exceeded by the *Cullinan* diamond, found near Pretoria, Transvaal, in 1905. Its original weight was 3,253¾ carats (about 1⅓ lbs.); and it was cut into nine stones, two of which, weighing 516½ and 309⅓/18 carats, are the largest brilliants in existence. See CULLINAN DIAMOND. The largest American diamond was found at Manchester, Va., and is known as the *Ou-i-nur*. See GEMS; GEMS, ARTIFICIAL; KIMBERLY. Consult Church's *Precious Stones*; H. C. Lewis' *Papers on the Origin of the Diamonds*; Streeter's *Precious Stones and Gems*, and *The Great Diamonds of the World*.

The fourth largest known diamond, the *Jonkers* (726 carats) discovered by J. J. Jonkers in the Elandsfontein diggings in South Africa, was sold raw for £65,000. It was subsequently sold to an American dealer and was cut up in 1936 into six crystals valued at \$3,000,000.

Diamond, Cape, a high bluff rising 333 ft. above the river, where the St. Charles flows into the St. Lawrence. On it stands the citadel of Quebec.

Diamond Rattlesnake. See **Rattlesnake**.

Diana, an ancient Roman goddess, who was afterward identified with the Greek Artemis. She is the female counterpart of Janus, who represented the sun, while she represented the moon.

Diana, Temple of, an ancient temple at Ephesus, sacred to the Greek goddess Artemis; classed among the seven ancient wonders of the world; was erected in the 6th century B.C., and rebuilt in the 4th century by Dinocrates. Its magnificent columns were over 60 ft. in height; and it numbered among its art treasures statues of Amazons by Phidias and Polyclitus, and a painting of Alexander the Great by Appelles. The temple was burned by the Goths in 262 A.D., subsequently restored, and finally closed by Theodosius I. The stones were then used in the construction of the nearby cathedral of St. John. The exact site of the temple was discovered in 1869 by J. T. Wood, and was re-explored in 1904-05 by D. G. Hogarth, who found the remains of several earlier temples on the same site. Consult J. T. Wood's *Discoveries at Ephesus*; D. G. Hogarth's *Excavations at Ephesus* (1908).

Diapason, originally the Greek term for

the interval of an octave in music. used in modern music to denote the complete range of tones of a musical instrument or of the human voice. Diapason is also the English name given to the foundation stops of the organ.

Diaphoretics are means used in medicine to produce intense sweating or diaphoresis. Dry heat and moist heat are each used. See **HYDROTHERAPY**. Hot drinks act reflexly on the nervous center which controls sweating, and the latter may also be stimulated by narcotics. Any agent which dilates the surface blood vessels produces sweating. Aromatics and carminatives are diaphoretic in action, and so are most condiments, such as pickles.

Diaphragm, or **Midriff**, in anatomy, the musculotendinous partition which in man and the mammalia generally separates the cavity of the chest or thorax from that of the abdomen. It is attached by its circumference to the front of the lumbar vertebræ, the inner surfaces of the six or seven lowest ribs and their cartilages, and to the back of the breast bone at its tip. The diaphragm is pierced by the œsophagus, the aorta, and the inferior vena cava. The upper surface of the diaphragm is in relation to the pleural membranes, which enclose the lungs, and to the pericardium, which encloses the heart. The lower surface, deeply concave in form, is lined by peritoneum, and has in apposition with it the stomach and spleen on the left side, the convex upper surface of the liver on the right side, and the kidneys, suprarenal capsules, and duodenum posteriorly.

Diaphragm, in mechanics, a plate or partition placed across the interior of a tube or hollow body of any size, employed in optical instruments, for the purpose of cutting off the superfluous rays of light, and producing greater intensity or sharpness of the image, as well as to correct aberration. The term is also used for the vibrating medium in a telephone.

Diarbekir, or **Diarbekr**, vilayet, Kurdistan, Asiatic Turkey, traversed by the Upper Tigris; stock raising is the chief occupation of the people, who are mostly nomadic. Cottons and silks are manufactured, and copper, galena, and other minerals occur. Area, 14,480 sq.m.; p. 620,000.

Diarbekir, or **Diarbekr**, capital of Diarbekir vilayet, on the River Tigris; red and yellow morocco leather, filigree work, and silk are now manufactured; and wool, mohair, copper ore, sheep and goat skins, butter and lard, and oak gall-nuts are exported. There are numerous mosques and about a dozen churches. Diarbekir occupies the site of the

ancient *Amida*, which was fortified by the Emperor Constantine; p. 38,000.

Diarrhœa, a morbid condition in which the contents of the intestines are continually being ejected in a more or less watery state, or as undigested matter accompanied by much fluid. Diarrhœa may be due to improper food, to poisonous substances, and to nervous influences; or it may be secondary to various infectious diseases. Diarrhœa may be either acute or chronic, and accompanied by colicky pains, marked weakness, thirst, loss of appetite, and occasionally by vomiting. See **CHOLERA**; **CHOLERA INFANTUM**.

Diarthrosis, in anatomy, that formation of joints which allows of free movement, as distinguished from that which affords practically none. See **JOINTS**.

Diary, a daily record of events or observations. Among the most celebrated *Diaries* in English literature are those of Madame D'Arblay, John Evelyn, Thomas Moore, Samuel Pepys, and Crabb Robinson; and the *Journals* of Robert Baillie, Sir Walter Scott, Lord Cockburn, and Henry Greville.

Dias, **Bartholomeu**. See **Diaz**.

Diastase, or **Amylase**, a soluble enzyme, or unorganized ferment, occurring in leaves, twigs, and germinating seeds of plants, as oats, wheat, potatoes, and especially in barley sprouts, from which it is prepared commercially. It is present also in saliva, in which it is known as *Ptyalin*. It has not been obtained pure, but is thought to be a mixture of a starch-liquefying enzyme, or amylpectase, and a saccharifying enzyme able to hydrolyze soluble starch, but without much action on raw starch.

Diastole. See **Heart**.

Diathermancy, the property possessed by different substances in various degrees of transmitting radiant heat. See **HEAT**.

Diathesis. The predisposition and constitution of the body which renders it prone to certain diseased states. The more prominent diathetic tendencies are the Gouty, the Tuberculous, and the Nervous.

Diatoms, or **Diatomaceæ**, botanically known as **Bacillariæ**, a group of microscopic aquatic plants belonging to the order **Algæ**. Over 10,000 species have been found, of which about 1,400 occur in North America. The Diatoms are unicellular plants, covered with a silicious epidermis. Some of these plants are free and move rapidly in the water, while others possess a secretion of gelatinous matter by which they attach themselves to various objects. The diatoms are classified in two

large groups; the Diatomeæ, with a silicious epidermis found in both fresh and salt water; and the Desmidiæ, which exist in fresh water only. See DESMIDS. Consult A. F. Arnold's *Sea Beach at Ebb-Tide*; Wolle's *Diatomaceæ of North America*.

Diatonic, in modern music is the term applied to (1) the natural or normal scale, major or minor, which proceeds mainly by whole tones; (2) the different species of intervals occurring between the various notes of that scale; and (3) music written wholly or for the most part in that scale.

Diaz, Armando (1861-1928), Italian army officer, born in Naples. In 1917, he was placed in supreme command of the Italian armies. Under his leadership in the second battle of the Piave the Italians cleared Northern Italy of the enemy, entered Trent and Trieste, and forced Austria-Hungary's unconditional surrender on Nov. 3, 1918. See ARMISTICE; EUROPE, GREAT WAR OF.

Diaz, or Dias, or Novaes, Bartholomeu (c. 1455-1500), Portuguese navigator, was born near Lisbon. In 1486, King John II gave him the command of two vessels with a view to following up the discoveries already made on the w. coast of Africa. Driven by a violent storm, he sailed around the southern extremity of Africa without immediately realizing the fact, and discovered Algoa Bay. Diaz was afterward superseded by Vasco da Gama, whom he accompanied to Cape Verde Islands, thence sailed to the Gold Coast. In 1497 he joined the expedition of Cabral, the discoverer of Brazil, but was lost in a storm.

Diaz, Felix (1868), Mexican political leader, nephew of Porfirio Diaz, was born in Oaxaca, Mexico; who by his seizure of the arsenal in Mexico City and week's bombardment of the palace in February, 1913, succeeded in conjunction with General Huerta, in causing the downfall of President Maderó. See MEXICO, *History*.

Diaz, Porfirio (1830-1915), a President of the Republic of Mexico, born in Oaxaca; took part in the War of Reform set on foot by Benito Juarez. He further distinguished himself in the War of the Intervention, ably opposing the French; and in 1863 he became commander-in-chief of the Republican army; defeated Marquez, and compelled the surrender of the City of Mexico—this success marking the end of the empire of Maximilian. In 1876, Diaz was made provisional president, and was re-elected continuously from 1880 to 1910, but in April, 1911, he was deposed by the successful revolution of Madero, who succeeded him

as President. See MEXICO, *History*. Consult Fornaro's *Diaz, Czar of Mexico* (1909); Godoy's *Porfirio Diaz* (1910); J. Creelman's *Diaz, Master of Mexico* (1911).

Diaz de la Peña, Narcisse Virgile (1808-76), French decorative painter, was born in Bordeaux. His fame rests on his brilliant Oriental pictures, his flower studies, and his Fontainebleau landscapes. Many of his paintings are in collections in the United States.

Diaz del Castillo, Bernal (1498-1593), Spanish historian, one of the 'conquistadores' who accompanied Cortes in his subjection of Mexico. His *Historia Verdadera de la Conquista de la Nueva España* is invaluable as a sincere narration by an eye-witness.

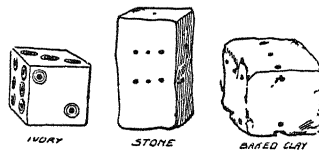
Dibon, Amorite city, on the Arnon, e. of the Dead Sea; now the ruined town Dhibân, where the famous Moabite stone of King Mesha, 900 B.C., was discovered, 1868.

Dibra, city, Serbia, near the confluence of the Black Drin and Radika Rivers; taken from Turkey by the Serbians in the Balkan War; p. 16,000.

Dibranchiata, an order of Cephalopoda; includes all living cuttlefish save the four-gilled pearly nautilus.

Dibrugarh, town, capital of Lakhimpur district, India; the terminus of steam communication on the Brahmaputra, and of a railway running to important coal mines and petroleum wells; p. 12,000.

Dice (plural of 'die'), small cubes marked on their sides with black dots, numbering from one to six. The use of dice was known



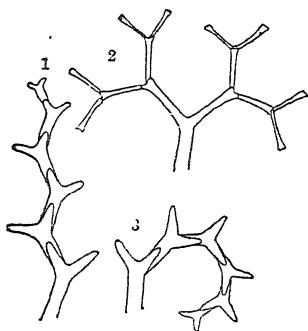
Egyptian Dice.

in the most remote ages. Dice exactly resembling those of the present day have been recovered from the ancient Egyptian tombs, and also from the more recent times of Græco-Latin civilization. Dice proper, then as now, were small cubes, on each of the six sides of which was marked a number, in such a manner that the numbers on the opposite sides always make up a total of 7: thus, if 6 is uppermost, the number underneath will be 1; 2 is the antipodes of 5, and 3 of 4. Dice are used in most games in this way: two (or more) dice

are placed in a cylindrical box with one end open; they are shaken, and then thrown out upon the table—the total being that of the numbers on the upper faces. It will be observed, therefore, that it is purely a game of chance. See Becq de Fouquières's *Les Jeux des Anciens* (1869); Bolle's *Knochenspiel der Alten* (1886); Reymond's *Alte und Neue Würfelspiele* (1888).

Dicentra, or **Dielytra**, in botany, a genus of hardy perennials belonging to the order Fumariaceæ, have much divided foliage, and graceful terminal racemes of double-spurred pink or yellow flowers.

Dichotomy, in botany, is a system of branching, especially of stems, on which the main axis or foot terminates in two branches, and each of these two branches in two further branches, and so on. When, however, one branch develops much more vigorously than



Forms of Dichotomy.

1, Scorpioid; 2, bifurcate; 3, helicoid.

the other, the successive vigorous branches appearing to constitute a continuous main stem, with the weaker divisions as its lateral branches, the system is a 'sympodial' dichotomy. When the stronger branch appears always on the left, or always on the right, the system is a 'helicoid' or 'bostrichoid' dichotomy; when alternately to right and left, the system is a 'scorpioid' dichotomy.

Dichroism. Many crystalline substances are dichroic—that is to say, when viewed in polarized light, their color depends on the direction in which the luminous vibrations take place within them; and if they are rotated while the source of light remains unchanged they exhibit a change of color. A simple instrument, called the dichroscope, has been invented for testing dichroic substances. The crystal is held in a good light opposite one end

of the instrument, and on looking through it two images are observed. If the substance be dichroic, these are of different colors, and the colors change when the dichroscope is rotated between the fingers. The more comprehensive term applied to the whole phenomenon is *pleochroism*. See text books on petrography.

Dickens, Charles John Huffham (1812-70), English novelist, was born at Portsea. The childhood of Dickens, in its general outlines, may be studied in the early chapters of *David Copperfield*, in his picture of young Pip in *Great Expectations*, and perhaps in some traits of Little Dombey. From 1816 to 1823 his father lived at Chatham, where the boy mainly educated himself, and read with the greatest avidity. His father had joined the reporters of the *Morning Chronicle*, 1835. Dickens, too, studied shorthand, and was attached to the same paper. In 1831-3 he was very busy as a reporter and the first of his 'Boz' sketches was published in the *Monthly Magazine*, December, 1833. To the *Evening Chronicle* he also contributed sketches: they were published by Macrone and were popular. In April, 1836, the publication of *Pickwick* began; the monthly numbers caught the public fancy; and the tale was accompanied in its way by the laughter of all England. While it was still running *Oliver Twist* was begun, and certain publishing entanglements caused his author to hurry forward with *Nicholas Nickleby*, 1838, and *Barnaby Rudge*, 1838. Then came *Master Humphrey's Clock*, but *The Old Curiosity Shop*, 1840, fascinated many, with the humor of Dick Swiveller and the Marchioness; more, perhaps, with the pathos of Little Nell.

In January, 1842, Dickens visited the United States. His *American Notes*, 1842, gave much offence to the citizens; he continued to offend in *Martin Chuzzlewit*, 1843. Of his *Christmas Carol*, 1843, and other Christmas books not much need be said. They were popular indeed. The years 1844-5 Dickens spent in Italy, which he found more congenial than the U. S. He wrote *The Chimes*, 1845; he returned to England, started the *Daily News*, found the work of editorship impossible, went to Switzerland, and began *Dombey and Son*, 1846-8. A new and highly successful enterprise was *Household Words*, 1850, admirably conducted by Dickens. The years 1849 and 1850 were distinguished by *David Copperfield*, which, with *Pickwick*, is the most classical of the author's works. This book is by many regarded as his masterpiece. *Bleak House*, 1852, is a favorite with a large number of his ad-

mirrors; *Hard Times*, 1854, has never been reckoned among Dickens' best things; and *Little Dorrit*, 1856-7, was rather conscientious than successful.

In 1858 Dickens settled at Gadshill where his last years were spent. He also wrote *Great Expectations*. *A Tale of Two Cities* appeared in 1859; this story of the French Revolution is in a rather different vein from



Charles Dickens.

(From the portrait by Frith.)

his previous works and for that reason is often called the least typical. In 1865 *Our Mutual Friend* was published. In 1867-8 Dickens revisited the United States and overtasked himself terribly as a reader to huge audiences. His health had never recovered from the shock of a railroad accident; but he was busy with *Edwin Drood* when the pen fell from his hand, and the world was the poorer by his death.

His fault, if it be a fault, was an overabundance of energy and overflow of life. He had poured his treasures forth with too lavish a

hand, in too many fields—theatrical, social, philanthropic, as well as literary. Of rest in his work he knew nothing; not because he either needed or coveted money, but because his spirit drove him to be always doing. Of his ten children, Kate (Mrs. Perugini) attained fame as a painter and Sir Henry Fielding Dickens (1849-1933) had a successful career at the bar. The death of this son in 1933 released the manuscript of *The Life of Our Lord* which Dickens had written for his own children and left with directions that it was not to be published until the death of the last one. It was promptly published in both England and the United States. Consult the standard work, Forster's *Life of Dickens* (1872-4); *Letters*, edited by Miss Hogarth and Miss Dickens (1880-82); Gissing's *Charles Dickens; A Critical Study* (1898); Chesterton's *Charles Dickens; a Critical Study*; Mary Dickens' *My Father as I Recall Him*; Burton's *Charles Dickens* (1919); Lupton's *Dickens, the Immortal* (1923); Carlton's *Charles Dickens, Shorthand Writer* (1926).

Dickinson, Emily (1830-86), American poet, was born in Amherst, Mass. She was educated in the public schools and at Mount Holyoke Female Seminary and after her brother Austin's marriage to Sue Gilbert, to whom she was devotedly attached, she spent much of her time in that household. But after 1862 she practically withdrew from the outer world and from the time of her father's death in 1879 she never left the house. Her literary work was not published until after her death, when in 1890, a volume of poems attracted much favorable attention. This was followed by a second volume of poems and a volume of letters. More recent critics have acclaimed Emily Dickinson as one of the truly great American poets. Consult Bianchi's *Life and Letters of Emily Dickinson* (1924); *Complete Poems of Emily Dickinson*, 1928; J. Pollitt's, *Emily Dickinson*, 1930; G. Taggard's, *Life and Mind of Emily Dickinson*, 1930.

Dickinson, Jacob McG. (1851-1928), American lawyer, was born in Columbus, Miss. In 1895-7 he was Assistant Attorney General of the United States and in 1903 was counsel for the United States before the Alaskan Boundary Tribunal. He was Secretary of War in the administration of President Taft.

Dickinson, John (1732-1808), American political leader and writer, was born in Talbot County, Md. During the Revolutionary War he was for a short time a brigadier general of Delaware militia. He was governor of

the Supreme Executive Council of Delaware 1781-2, and of Pennsylvania 1782-5. He represented Delaware in the Annapolis Convention and in the Constitutional Convention at Philadelphia. In 1783 he was one of the founders of Dickinson College. He first attracted general attention by his famous *Letters from a Farmer in Pennsylvania to the Inhabitants of the British Colonies*, which were directed against the Townshend Acts of 1767. Conservative by nature, he opposed the Declaration of Independence as being at least premature, and thus permanently lost much of his popularity, but he supported the Constitution of 1787 and by a series of letters, signed 'Fabius,' did much to induce Pennsylvania and Delaware promptly to ratify that document.

Dickinson College, located at Carlisle, Pa., was founded in 1783, under Presbyterian auspices. Since 1833 it has been working under the auspices of the Methodist Church.

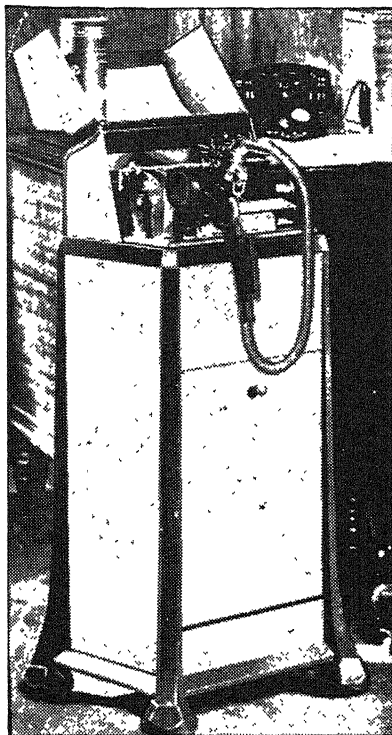
Dicotyledons, a division of flowering plants which constitute one, and much the larger, of the two great divisions, the other being known as Monocotyledons. They are characterized by the following features: The germinating seeds develop two or more seed-leaves or cotyledons, whence their name. The stems increase in thickness by the formation of new tissue outside the existing fibre—*i.e.* between it and the bark. The leaves are net-veined or reticulated. The parts of the flower are commonly arrayed in fives or fours. Dicotyledonous plants are usually classified under two main divisions: *Achichlamydeæ*, in which one or more of the floral whorls are absent, and *Sympetalæ*, in which the petals are united, as in the orders Primulaceæ, Labiatæ, and Compositæ.

Dictaphone, a machine akin to the phonograph, much used in business. It consists of a mouthpiece and a wax cylinder, on which are recorded the words of the person dictating, the cylinder afterwards being placed in a transcribing machine and its contents being typed direct from the record. The machine has the advantage of dispensing with the services of a stenographer.

Dictator, the title of an official of the ancient Roman republic called into being during some extraordinary crisis, when it was felt that the supreme control of one strong man was essential. The first dictator was appointed in 501 B.C. Their power exceeded that of the consuls, in respect of their greater independence of the senate, their freedom from the interference of a colleague, and their

possessing the power of life and death over all citizens without appeal.

The dictatorship was confined to the patricians until 356 B.C.; the last regular dictator was M. Junius Pera, in 216 B.C. In 82 B.C. Sulla had himself elected dictator 'to settle the constitution,' and held the office for three years; but in every respect his dictatorship was unconstitutional, as was also



A Dictaphone.

that of Julius Cæsar, who was appointed dictator for one year in 48, for ten years in 46, and for life in 45 B.C. In modern times the dictatorship is the child of revolution, and is sometimes found among the South American republics, as well as in Haiti and San Domingo. Examples of a dictatorship in modern times are found in the rule of Mussolini in Italy and Hitler in Germany.

Dictionary, a book consisting of a list (generally alphabetical) of the words of a language, or of some special group of them, with explanations of their meanings. Other information also is generally given, such as pronunciations, etymologies, syllabication.

and accounts of the things in which the words are applied. The explanations may be in the same or in another language. The dictionary may be special (confined to one subject) or general (covering all subjects). The number and variety of books of this kind, in virtually all known languages, are enormous. The name dictionary is also given to various books—such as dictionaries of biography, and even encyclopædias—which resemble the dictionary proper in little besides the alphabetical arrangement of topics.

Works of a lexicographical character were compiled in Greece as early as the time of Alexander the Great; but the first of importance that has survived is the *Homeric Lexicon* of Apollonius, an Alexandrian grammarian of the time of Augustus. In modern European languages, other than English, the historically most important works are the *Vocabolario degli Accademici della Crusca* (1612), long the standard of the Italian tongue; the *Dictionnaire de l'Académie française* (first ed. 1694); *Dictionnaire de la langue française*, by E. Littré (1863-72, supplement 1878); the *Deutsches Wörterbuch* of Jacob and Wilhelm Grimm (1854). The earliest precursors of dictionary work in English are the collections of Anglo-Saxon glosses preserved in libraries at Leyden, Epinal, Erfurt, and Corpus Christi College, Cambridge. These date from the 7th and 8th centuries. The first English-Latin dictionary, called the *Promptorium Parvulorum*, written by Geoffrey the Grammarian, was printed in 1499. Dictionaries for the explanation of the English language began with lists of hard words, *The Table Alphabeticall of Hard Words*, by Robert Cawdrey (1604). The English dictionary of Dr. Johnson, which was published in 1755, was the first freely to illustrate the words and senses by literary quotations, and to distinguish with care the different meanings of words.

In 1806 Noah Webster published a small octavo dictionary of 'words not found in any similar work'; and this was followed in 1828 by his *American Dictionary of the English Language*, which has often been revised and enlarged. The greatest of English dictionaries, and probably the most notable example of the scholarly application of the principles and results of modern philology to lexicography, is the *Oxford English Dictionary*, edited mainly by Sir James A. H. Murray. Second only to the *Oxford* in philological scope and fullness, and differing from it in being widely encyclopædic, is the

Century Dictionary, first published in 6 volumes, edited by W. D. Whitney, in 1889-91. Among modern dictionaries of the various languages may be named the following: Harper's (Lewis') *Latin Lexicon*; Larousse's *Dictionnaire de la langue française*; the *New Standard Dictionary of the English Language*, prepared under the chief-editorship of Dr. Isaac K. Funk. In addition to the dictionaries of languages there are many on special subjects. Among the special topics covered are Architecture, Biography, Philosophy and Psychology, Quotations, Slang, etc.

In 1927 the Learned Societies of the United States undertook the publication of a comprehensive *Dictionary of American Biography*, the first volume of which appeared in 1928.

Dictograph, one name given to the adaptation of a telephonic circuit with a transmitter in order to increase or direct a reproduction of sound at the receiving apparatus. This type of instrument is allied to the acousticon and to the amplifying system used in audience rooms, and is also used in the securing of oral evidence of private interviews of suspected persons.

Dictum, an expression of opinion by a court or judge in a decision upon some point not in the case on trial, but as throwing light on it.

Diderot, Denis (1713-84), French encyclopædist, was born in Langres, Champagne. He conceived a scheme for a general encyclopædia to supersede the French version of Ephraim Chambers' English work. But the project assumed a more important aspect, and began to appear in 1751, under the title of *Encyclopédie, ou Dictionnaire raisonné des sciences, des arts, et des métiers*. Though doing much of the work himself, Diderot was assisted by many of the ablest writers in France; and the work served as a proselytizing medium for the free-thinking and sceptical philosophers. His tales, *Jacques le fataliste* and *Le neveu de Rameau*, have been widely appreciated. Intellectually stronger than Voltaire or Rousseau, Diderot had not their high literary gifts, but his personal influence was greater than that of his books.

Collections of Diderot's works were published by Naigeon, in 15 vols. (1798); and by Assézat and Tournoux, in 20 vols. (1875-7).

Dido, also called **Elissa**, according to legend, was the daughter of Belus, king of Tyre. After her father's death Dido

fled to Africa, where she built Byrsa, the citadel of ancient Carthage. Virgil, in the *Æneid*, makes the hero Æneas visit Carthage, and fall in love with Dido; but the gods ordered him to leave her, and on his doing so she slew herself.

Didot, François (1689-1757), founder of a noted French family of printers. His son, FRANÇOIS AMBROISE (1730-1804), published a collection of classics prepared for the education of the dauphin, son of Louis XVI.—labors shared by his brother PIERRE FRANÇOIS (1732-95). A son of Pierre invented the Didot paper-making machine, and produced marvellously minute editions.

Didymium, a metal formerly believed to be one of the metallic elements of the 'rare earths' obtained from such minerals as cerite, and gadolinite. It has since been discovered to consist of two elements, praseodymium and neodymium, which have atomic weights of 140.92 and 144.27 respectively.

Dielectric, the name given by Faraday to insulators in static electricity, that is, for all substances through which electrostatic induction takes place. The dielectric strength of an insulating medium is its power of resisting disruptive discharge through it.

Dielman, Frederick (1847-1935), painter, was born in Hanover, Germany, and was taken to America as a child. He was one of the founders of the Society of American Artists; and was made a member of the National Academy in 1883 and was elected its president in 1899. He designed the mosaic panels *Law and History* for the new Library of Congress.

Dieppe, seaport town and watering place, department of Seine Inférieure, France. Notable buildings are the Casino, Etablissement des Bains, the Hôtel de Ville, the Musée, containing an art collection and a library presented by Saint-Saëns, the Castle, erected in 1433 as a defence against the English, Church of St. Remy, and Church of St. Jacques. Aug. 19, 1942 it was the site of the first large Commando raid of World War II.

Dies, Martin (1901-), U. S. Congressman, was born in Colorado, Texas; educated at Wesley College and Univ. of Texas. He was chairman of the House Committee Investigating Un-American Activities, created 1938.

Dies and Die-sinking. A die is a hard metal device used for striking the impression on coins and medals and for stamping plates or sheets of metal into various shapes. The art of preparing dies is known as die-sinking.

The engraving of dies for stamping coins is of very ancient origin. It was known to the Greeks 800 years before Christ and attained a degree of excellence that has never been exceeded between the years 415 and 336 B.C. The art of cutting dies in the comparatively deep intaglio required for medals dates from the beginning of the 16th century. The application of dies to sheet metal work is of more recent development, being a product of the 19th century.

Diesel Engine, a modification of the type of oil-engine which burns heavy oil. It differs from the normal engine of this type in that no external ignition needs to be applied, and that no actual explosion takes place. See OIL AND GASOLINE ENGINES. A great advance in the employment of Diesel engines was achieved in their use to haul high speed trains on many of the principal lines in the West. During World War II the Diesel engine was increasingly used for both land and sea transportation.

Dies Iræ ('Day of Wrath'), a Latin hymn on the Day of Judgment; probably by Thomas of Celano, a Franciscan friar, who died about 1255. The commission appointed by the Council of Trent to prepare a uniform Missal (published by Pius V. in 1570) included the hymn in the mass commemorating all faithful dead, and it thus obtained universal recognition.

Dies Non, a legal term, abbreviation for *dies non juridicus*, a day not juridical; one on which the courts are not open for business, as Sundays and certain holidays; namely, Christmas and Good Friday in England, and Christmas, July 4, and January 1, in the United States.

Diet (Lat. *dies*, 'a day'), originally a session or sitting of a body of delegates, applied by a transference of thought to the bodies themselves. It is used specifically of the legislative bodies of the German states, of the parliaments of certain Northern European nations, as Sweden and Denmark, and of the meetings of the representatives of the old German (Holy Roman) Empire, as the Diets of Worms, and Augsburg.

Diet and Dietetics. It is known by the medical world that treatment through diet is as potent, practical and necessary as any other method of medication. Lavoisier's discovery of the relation between oxygen intake, carbon dioxide output, etc., in relation to the body and its heat and food; Rubner's development of the relationship between food and body activity; Liebig's researches

of food and body composition; Eijkmann's finding that food may bring on certain diseases and cure others; Mendel's and Osborne's ability to control growth through one food element; Hopkin's researches of subtle elements in nutrition; McCollum's findings showing that old age is prolonged through varied diet; have all combined to give nutrition a high dignity and importance.

Since the human body is a mechanical power plant, fuel is the first essential if it is to continue to function. This fuel consists of six main elements—protein, necessary to repair the losses of active cells; fats and oils to furnish heat and also energy; carbohydrates, to furnish energy and also heat; mineral matter, to furnish salts; water, to keep up the required two-thirds of the weight of the body in water; vitamins, which are extremely important 'accessory food factors.' A total of about 15 or 20 elements constitute the composition of the body; the main ones being: oxygen, carbon, hydrogen, nitrogen; others are calcium, phosphorus, potassium, sulphur, chlorine, sodium, magnesium, iron, fluorine. As a convenient unit for expressing diet in measurable units, the 'calorie' is used. The energy requirement of the body is expressed in calories, units of heat, the so-called large calorie being used. As to the amount of fuel needed, the results of numerous investigations agree closely. The two principal factors influencing this requirement are body-weight and activity. Progress has been made in recent years in settling controversies as to just what proportion of protein there should be in the diet. A quarter of a century ago Chittenden at Yale warned that the appetite for proteins was not a satisfactory guide. At that time meat consumption was far higher than now, and today there is a distinct reduction in the average intake of protein. Instead of being as high as 20% of the day's diet, as it was at that time, it has been reduced materially, and a protein diet of between 10 and 13% is now widely favored. The foods rich in protein are beef, cheese, codfish, egg whites, beans, peas, etc.

Fats and Oils are very important heat and energy-creating elements. Fat foods include butter, vegetable oils, lard, suet, cream, bacon, salt pork, pork sausage, chocolate or rich and oily nuts. Some fats, especially butter and cream, provide vitamin A. Fats and fat foods should constitute 20% of the normal diet. Carbohydrates are in the main sugar and starch, 18 ounces of which are necessary in the daily normal diet. Starch

food sources are wheat, corn, potatoes, tapioca, sago, etc. Mineral matter are substances exceedingly essential to health, and the intense desire of the body for them is illustrated by the fact that in savage countries salt is far more desired than gold by the natives and can be used as a trading medium. Salt is existent in all bodily tissues. Although some foods supply it, it is rarely in sufficient quantity, and it aids digestion, furnishing chlorine for hydrochloric acid in gastric juices. Children and pregnant women very particularly need mineral elements to supply bone and teeth building elements. One reason why fruits and vegetables are very necessary in the diet is because they supply invaluable minerals. Milk is most valuable for supplying calcium. Even meat and eggs contain iron, and cereals phosphorus. When fruits and vegetables are used in variety and in quantities sufficient to provide 20% of the fuel, corresponding with 600 calories out of the 3,000 needed per man per day, none of the minerals are likely to fall below the required quantity.

There is no reason to suppose that lack of iron alone is the cause of anaemia, but one of the recognized factors in correcting this abnormal condition is an excess of iron in the food. In procuring such an excess, fruits and vegetables are important because if properly prepared, they serve to tempt the appetite. When milk or cheese forms the protein basis of the diet, special effort must be made to obtain iron from fruits and vegetables. As a source of iron, spinach stands in a class by itself. Other green-leaf vegetables such as lettuce and dandelion greens are also important. Vitamins have now been shown to be of crucial importance in the diet. This was recognized in a practical manner centuries ago when seamen so frequently developed scurvy because of limited diets, and it was then written into English maritime law that ship-owners must provide lime-juice for their crews. The exact nature of vitamins for a long time eluded chemists, and even their discovery was made only in the 20th century. They were named in 1911, but the separate nature and character of different vitamins has only slowly proceeded; one after another new ones being added to the list and given as designations the letters of the alphabet. A vitamin may be defined as an invisible but potent factor in food which has a specific and profound influence upon nutrition. Without vitamins, development is sure to be impaired, and in

later life the body is likely to fall prey to certain specific ailments. Vitamins do not apparently originate to any extent in the animal body but must be obtained from plants.

The main vitamins will now be described: Vitamin A is otherwise known as fat-soluble A, is essential for growth, well-being at all ages, and successful reproduction. A deficient supply of this vitamin leads to weakening of the body tissues and increased susceptibility to bacterial infection, particularly of the epithelial tissues. Milk and dairy products, eggs, liver, and leafy vegetables are among the richest sources of vitamin A. Vitamin B, formerly known as water-soluble B, or the growth-promoting water-soluble vitamin, is now often called the vitamin B complex. Now it is generally believed that vitamin B is made up of at least two independent vitamins. One of these is the anti-neuritic vitamin which is fairly easily destroyed by heat. The other is a vitamin much more stable to heat than the anti-neuritic vitamin and differs from it markedly in its physiological properties. Vitamin B has been considered to be essential for the maintenance of appetite, growth, reproduction, lactation, proper functioning of the digestive tract, and resistance to bacterial infection. Its complete absence from the diet of experimental animals is followed in a short time by loss of appetite, rapid loss of weight, and death, sometimes but not always preceded by nerve degeneration. Vitamin F, B₁, or the antineuritic vitamin, is the relatively heat-stable, water-soluble vitamin which, when absent from the diet of experimental rats, is followed by loss of appetite, rapid loss in weight, and a condition of nervousness and irritability, usually followed by spasms and paralytic seizures. Recovery following the administration of a rich source of this vitamin takes place with dramatic rapidity. Vitamin G, or B₂, sometimes known as the antipellagric vitamin, is the relatively heat-stable, water-soluble vitamin so closely associated in occurrence and properties with the antineuritic vitamin F that for many years its independent existence escaped observation. A deficiency of this vitamin from the diet of rats is followed by a rapid retardation of growth and loss in weight. Vitamin C is the antiscorbutic vitamin, formerly known as water-soluble C. Complete absence of this vitamin from the diet of man and certain animals leads to the well-known disease, scurvy. It is present in varying amounts in vegetables and fruits. Especially good

sources are citrus fruits, raw cabbage and turnips, and tomatoes, raw, cooked, or canned. Vitamin D is termed the antirachitic vitamin. At present vitamin D occupies a unique position among vitamins in being the only one which has been synthesized or manufactured from a definite chemical compound. Irradiated ergosterol is now used rather extensively in some countries for the prevention and cure of rickets. Cod-liver oil is one of the best of all known natural sources of both vitamins A and D. Vitamin E, the reproductive or antisterility vitamin, resembles vitamins A and D in certain chemical and physical properties but differs from either of them in distribution. It is practically absent from cod-liver oil but present in vegetable oils. The oil of wheat embryo is one of the richest sources of vitamin E. Another good source is fresh lettuce.

The dangers of civilized life through the increased use of concentrated foods are now fully realized. Whereas once the milling of grains was done coarsely it is now done very finely, and this and other tendencies have inclined toward reduction of the 'bulk' or residue-containing portion of the diet. A certain minimum volume in the food residue of normal healthy people is needed as a means of preventing constipation, and for the maintenance of this volume fruits and vegetables are almost indispensable. The newer researches in diet indicate the special importance of the maintenance of the balance between acid-making and alkaline-making foods. *Acidosis* indicates a condition in which the body is less alkaline than it should be, thus foods should balance themselves between acid and alkaline-ash content. The foods containing a very high acid-ash content are (in order) oysters, egg-yolk, fish, chicken, meat, oatmeal. The foods containing the most definite alkaline-ash content are (in order) lima beans, beans, raisins, almonds, beets, carrots. This is, of course, on a per 100 gram basis. Citrus fruits are definitely also in the alkaline group, as are many fruits and vegetables. Known as 'acid' fruits, the citrus fruits nevertheless have an alkaline reaction.

From this consideration of the dietary requirements of the adult, certain facts stand out prominently of which use may be made in planning the daily meals for the family. Perhaps the most conspicuous of these is the value of *milk*. Not only is milk a satisfactory source of fuel, but its proteins are in considerable quantity and of the best quality; rich in calcium and phosphorus, and with

some iron, its mineral salts are of first importance, and its supply of vitamins is large. Thus, in its ability to make good the deficiencies of other foods, milk is unequalled and 'a quart of milk a day for every child and a pint for every adult' should be the goal. A fact not hitherto mentioned is that milk is of value in reducing intestinal putrefaction, the products of which cause auto-intoxication. This property seems to be due mainly to its content of lactose (milk sugar). Another fact that is to be emphasized is the value of *fruits and vegetables* in the diet. It is evident that as sources of mineral salts and of the vitamins they are very valuable foods. Also, it should be remembered that the *whole-grain products*, because of the mineral salts and vitamins which they supply, have a food value far beyond that indicated by their content of protein and carbohydrate.

During the early months of pregnancy the diet should be simple, easily digested, and adequate in all respects, differing little in character from that to which the individual has been accustomed. As the diet needs to be increased during the later months, great care should be exercised to avoid indigestion and to see that the supply of calcium and phosphorus is abundant to meet the needs for bone formation and that there is sufficient iron to establish the necessary reserve of that element. Plenty of milk, some eggs, a moderate amount of meat, with an abundance of fruits, green vegetables, and whole grain products should furnish these substances and provide for the prompt elimination of waste products. During the last months the energy demands will probably be increased by about 20 per cent. over the normal.

For an infant, no other food approaches in value the milk of a healthy mother. Modified cow's milk is the best substitute to be obtained. Where the infant is given this modified cow's milk, it must be supplemented by an antiscorbutic. In any case, after the sixth month fruit juices, and very soon strained vegetables, may be added to the diet, with benefit to the baby. These will supply the much-needed iron and accustom the child to other food besides milk. The quart of milk a day should be continued until the child is grown. Consult the publications of the Children's Bureau and the Office of Defense Health and Welfare Services, at Washington, D. C. See also Rose's *Foundations of Nutrition* (1927) and *Feeding the Family* (1929); Sansum's *The Normal Diet*

(1927); Frederick's *Cooking As Men Like It* (1930).

Dietrich, Marlene, (1904-) motion picture actress, was born in Berlin. After a successful stage career in Europe she entered Hollywood. Among her successful motion picture plays were *Shanghai Express*, *Catherine the Great*, and *The Garden of Allah*. Later she scored a hit with a series of Westerns, among them *Destry Rides Again*.

Differences, a term used on the stock exchange to denote the balance due between broker and principal in respect to transactions when securities are not taken up or delivered, as the case may be.

Differentia, the term used in logic to signify the characteristic by which any one species in a genus is distinguished from the other species.

Differential Calculus. See **Calculus**.

Differential Equations. A differential equation is an equation involving differentials or derivations, for example

$$(x+y)dx+xdy=0.$$

$$\frac{d^2y}{dx^2}+a^2y=0.$$

Many physical laws give rise to differential equations. For example, in the case of a falling body we have

$$\frac{d^2s}{dt^2}=g,$$

which is the differential equation expressing the law of the constancy of acceleration. A *solution* of a differential equation is a relation between the variables not involving derivatives or differentials which satisfies the equation. For example,

$$S=\frac{1}{2}gt^2+C_1t+C_2$$

is a solution of the equation for falling bodies. The graphical representation of a differential equation is a set of curves arising from giving the constants in the general solution all possible values. For example,

the graphical expression of $\frac{d^2s}{dt^2}=g$

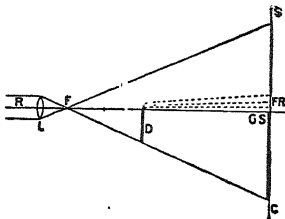
is a set of parabolas with axes parallel to the S axis in the t, s plane.

The elementary treatment of the subject is concerned mainly with the problem of integration, that is, with the actual solution of the equation. This is the subject matter of the ordinary textbook. For the elementary theory, consult A. Cohen's *An Elementary Treatise on Differential Equations*; A. R.

Forsyth's *A Treatise on Differential Equations* (4th ed., 1914); H Bateman's *Differential Equations* (1918).

Differentiation in biology, the evolutionary process in the course of which an organism becomes increasingly complex, and increasingly fitted for its special conditions of life.

Diffraction, the name given to a set of optical phenomena which occur at the borders of shadows. For most practical purposes we may regard light as traveling in rectilinear rays, so that the edge of the shadow cast by an opaque body will be in the same straight line with the edge of the



Diffraction of Light.

R, Ray of light; L, lens; F, focus; SC, screen; D, disc; GS, geometric shadow; FR, fringes.

body and the source of light. It was discovered, however, by Grimaldi (d. 1663), that under certain conditions this relation was not satisfied. He found that when a small disc was placed in the diverging pencil of light obtained by passing sunlight through a small hole in the shutter of a darkened room, the shadow cast by the disc on a white screen was distinctly larger than the geometrical projection of the disc, and that the shadow was not clearly defined but bordered with three iris-colored fringes.

The general explanation of these and similar phenomena follows quite naturally from the fundamental principles of the wave theory of light (see LIGHT), although the details of calculation in many instances are of great complexity. The one root-principle to be steadily borne in mind is that the intensity at any point is a resultant effect. Similar phenomena are observed when light is allowed to pass through a narrow slit, the central image of the slit appearing to be bordered with colored fringes. The colored appearance in diffraction phenomena arises from the fact that the differently colored constituents of white light have different wave lengths. The longer wave lengths give broader bands, so

that violet begins nearest to the image of the slit, while the first red band is formed farther away.

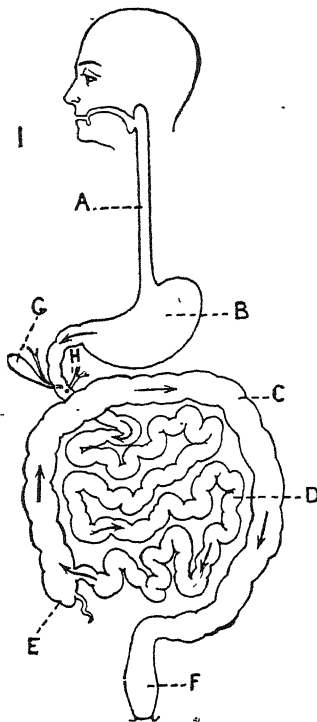
Since one small opaque body can produce diffraction effects, a great many small bodies together will, of course, produce like results, but more marked. For example, the coronæ or glories seen round the moon shining through a fleecy cloud are the result of diffraction through the numerous small particles which compose the cloud. Similarly the image of the sun viewed after reflection from the dusty surface of a stagnant pool may often be seen surrounded by colored rings. A furrowed surface like mother-of-pearl acts in essentially the same way, the continuous wave front of a ray of light falling upon it being made discontinuous, so that the luminous effect produced at any point becomes quite altered, and the well-known play of colors is the result.

Diffusion. If we hold the universally accepted theory that each kind of matter consists of ultimate particles called molecules, the facts of the interdiffusion of fluids are immediately explained in terms of what is known as the kinetic theory of matter. According to this theory the molecules of a fluid have considerable freedom of motion among themselves. In the case of gases under ordinary conditions, such as air, hydrogen, carbon dioxide, coal gas, etc., this relative freedom of motion is much greater than in the case of liquids. In the case of gases and liquids the rate of diffusion depends upon the gradient of concentration, although the rate itself is much less in liquid than in gases, owing to the greater crowding of the molecules together and the smaller values of their relative velocities. When diffusion is taking place in a liquid, we can draw an imaginary surface separating a part of less concentration from a part of greater concentration; and it is in the direction of diminishing concentration that diffusion occurs. By the process of stirring we greatly enlarge the surface separating such regions, and diffusion occurs the more quickly. In the lungs the oxygen supplied from the air replaces by diffusion the carbon dioxide given off, aided by chemical processes which keep up a gradient of concentration—of oxygen increasing outwards, of carbon dioxide increasing inwards. Diffusion may also occur between fluids and solids, or even between solids and solids.

Digby, tn. and port of entry, cap. of Digby co., Nova Scotia, Canada, on the Bay of Fundy and on the Dominion Atlantic R. R.

It is a fishing center, its herrings being specially noted. It is a well-known summer resort.

Digestion is the term applied to the series of processes which food undergoes within the body in the course of its assimilation and absorption. In the mouth food is mechanically subdivided by mastication, is moistened and mixed with saliva, and is rolled by the tongue into a bolus or mass of a size suitable for transmission through the œsophagus or gullet. The stomach, like the mouth, performs



Digestive System.

A, œsophagus; B, stomach; C, large intestine (colon); D, small intestine; E, cæcum; F, rectum; G, gall bladder and biliary duct; H, pancreatic duct.

its share of digestion by mechanical and by chemical means. Its muscular walls undergo a series of wavelike movements, whereby the food is churned up, mixed with the gastric secretion, and finally forced into the intestine through the ring of the pylorus, the contraction of which retains the food in the stomach while gastric digestion is proceeding. The chemical part of the stomach's work is

performed by the gastric juice, which contains a ferment termed pepsin and free hydrochloric acid. The gastric juice commences to trickle into the stomach as soon as the taste of food in the mouth is perceived. In normal digestion the glands in the wall of the stomach respond but slightly at first to the arrival of food and saliva, but about fifteen minutes after the food has been swallowed the gastric fluid is secreted more freely. At first the hydrochloric acid is present only in sufficient quantity to neutralize the alkalinity of the saliva, but later the whole contents of the stomach are rendered distinctly acid. The action of the gastric juice is upon those groups of foods known as albuminates and albuminoids. Pepsin transforms the insoluble albumin of flesh foods and legumes into peptone, and the gelatin of jellies into gelatin-peptone.

After the food has been churned in the stomach for from three to four hours, it is reduced to the condition of chyme, and it is then passed through the pylorus into the duodenum, or first part of the small intestine. Here it encounters two other digestive fluids, the pancreatic juice and the bile, commixture with which renders it milky in appearance and alkaline in character. It is with the assimilation of the hydrocarbons that the liver and pancreas are principally concerned, as well as with the completion of the starch conversion already begun by the saliva. The alkaline pancreatic juice produces an emulsion in which the fat globules are suspended in such a fine state of division that they can be absorbed by the lacteals. A small portion of the fat is also taken up in the forms of soluble fat soap. The precise part played by the bile in the economy is as yet unknown, but it is certainly an important agent in the digestion of hydrocarbons.

In the small intestine the dissolved food-products pass into the blood-vessels and lymphatics, a rich plexus of which surrounds the bowel, and thus enter the general circulation. The red blood corpuscles are largely concerned in taking up the peptones, which they carry to all parts of the body as globulins. Part, however, of the peptones, and nearly all the sugars, seem to be stored up in the liver as glycogen, to be given off as the organism requires. The large intestine absorbs fluid, and, possibly, some small portion of the elaborated product of the small intestine that may have escaped the higher absorbent surfaces. It secretes no digestive ferment, but its absorbent faculty may be utilized in feed-



DIVERS AND OCTOPUS

ing a patient *per rectum*, predigested foods being employed. Alcohol is one of the few substances absorbed by the stomach, and the rapidity of its action as a stimulant is due to the fact that it finds its way into the blood immediately after ingestion.

Digitalis, or **Foxglove**, a genus of hardy plants belonging to the order Scrophulariaceæ. Their flowers are characterized by a five-partite calyx, an irregularly bell-shaped corolla, four stamens, of which two are long and two short, and an oval capsule. The common purple foxglove is a biennial plant. Its leaves are used for the preparation of the drug digitalis. Digitalis in moderate doses increases the power of the heart's contraction, while slowing it. It also contracts the



John Dillon.

(Photo by Reginald Haines.)

arteries, thus raising the blood-pressure, and so acting as a diuretic.

Digitigrade, a term applied to animals, as cats and dogs, which walk upon their toes only, in opposition to plantigrade animals, as bears and men, which apply the whole of the under surface of the foot to the ground in walking.

Dijon (anc. *Divio*), cap. of dep. Côte-d'Or, France. Among its notable buildings are the cathedral Ste. Benigne (1271); Notre Dame, a fine example of 13th-14th century architecture, with a clock from Courtrai (1383); St. Michel (1529); and the Hôtel de Ville, formerly the palace of the dukes of Burgundy. Dijon rose into importance after 1015, when it became the capital of Burgundy. Philip the Good, John the Fearless,

and Charles the Bold (dukes of Burgundy), Bossuet, Crébillon, Rameau the musician, and Rude the sculptor, were natives, and St. Bernard of Clairvaux was born close to the town; p. 83,815.

Dilemma is the term used in logic to signify a kind of argument in which you are offered a choice between two suppositions, such that you must accept one or other of them, and yet such that from either of them the same repugnant conclusion follows, or from the two of them two equally repugnant conclusions follow. The two suppositions upon which the arguer's opponent is thus impaled are 'the horns of the dilemma.'

Diligence, that degree of care required by law in many situations; negligence, or the lack of it, is often determined by the degree of diligence displayed.

Dillon, John (1851-1927), Irish politician. He was 'suspended' from the service of the House of Commons under three successive Speakers, and imprisoned under both a Liberal and a Conservative government—in 1888 and in 1891.

Dillon, John Forest (1831-1914), American lawyer, born at Northampton, N. Y. He became professor of real estate and equity jurisprudence in the Columbia Law School, New York, resigning in 1882 to resume legal



Ernest Dimnet.

practice. He was counsel for the Missouri Pacific, Union Pacific, and Manhattan Elevated Roads, and the Western Union Telegraph Company.

Dimension, Fourth. See **Geometry**.

Dimensions, in physical quantities, such

as energy, force, electrical intensity, etc., can be defined in terms of three fundamental quantities, which are generally taken to be length, time and mass.

Dimnet, Ernest (1866-), a French abbé, writer, educator. He has made frequent lecture tours in England and the United States. Important writings are *Figures de Moines* (1908); *The Art of Thinking* (1928).

Dimorphism. In zoology and botany, a term used to designate the occurrence of some organisms in two forms. In not a few insects and crustaceans the males and females differ so markedly from one another that in some cases they have even been referred to different genera. This is sexual dimorphism. In plants the common primrose and its allies offer a familiar example of dimorphism. In the mineral kingdom dimorphism is the occurrence of any substance in crystalline forms belonging to two distinct systems. Familiar examples are carbon, which occurs as diamond (cubic or isometric) and as graphite (hexagonal).

Dinan, tn., dep. Côtes-du-Nord, France. It is still surrounded by 13th century ramparts. It has the church of St. Malo (1490), the church of St. Sauveur in Romanesque-Gothic style, the town hall, and the former castle of the dukes of Brittany. Dinan is a favorite health resort, and has many English residents; p. 10,534.

Dinapur, cantonment on l. bk. of the Ganges, Bengal, India. The mutiny of 1857 broke out here; p. 33,699.

Dinarchus, last of the ten Attic orators, was born at Corinth in 361 B.C., but lived most of his life at Athens.

Dinaric Alps, the connecting link between the (Julian) Alps and the mountain system of the W. Balkans.

Dingey, or Dinghy, a small pulling boat of 12 or 14 ft. in length for two or four oars, and usually made as light as possible. Yachts and torpedo boats are usually supplied with a dingey, often of some collapsible type.

Dingle, pueb., Iloilo prov., Panay, Philippines, on the main road of the province; D. 12,129.

Dingley, Nelson (1832-99), American public man, was born at Durham, Me. From 1881 until his death he was a U. S. congressman from Maine, and took an active part in all matters relating to the tariff. In 1897 he drafted the measure known as the Dingley Bill.

Dingo (*Canis dingo*), the native wild dog of Australia. Except for its superior size and

strength, it is not unlike the fox. It is nocturnal in habit, and hunts usually in small family parties.

Dinka, a negro tribe living on both banks of the Bahr-el-Abiad, in the Egyptian Sudan, from 6° to 12° N. lat. They are tall and very black, and are brave fighters, furnishing material for the Sudanese army.

Dinosaurs, an order of fossil reptiles belonging to the Mesozoic epoch. Some species had the external configuration of lizards or alligators, with four small limbs supporting an elongated body, which terminated in a long, pointed tail. In others the legs were



Dinosaur.

large and strong, while the fore limbs were small and apparently adapted only for prehension. These forms resembled a kangaroo or even a bird. The dinosaurs include some of the most gigantic animals that have inhabited the globe, although some species seem to have been no larger than a hen.

Towards the close of Jurassic times the dinosaurs were the monarchs of land and sea. Some were herbivorous, and probably subsisted on the leaves and young shoots of trees; others were carnivorous, and preyed on small animals and reptiles. Remains of dinosaurs have been found in Triassic, Jurassic, and Cretaceous strata, in Europe and North America and, very recently, in Northern Asia. Many of the most remarkable specimens found prior to 1923 were disinterred from the Jurassic rocks of Western North America through the efforts of Marsh and Cope. In 1922 an Asiatic expedition under the leadership of Roy Chapman Andrews, dispatched by the American Museum of Natural History, discovered the first fossil remains of dinosaurs ever found in Asia north of the Himalayas. In 1923 Professor Andrews discovered the first fossil dinosaur eggs—twenty-five in number—

ever seen by man. The Mongolian discoveries are held by scientists to supply the earliest stages of offensive and defensive reptilian evolution which has its culmination in the specimens previously obtained in America and Europe.

Dinotherium, a primitive ungulate belonging to the same group as the existing elephants (Proboscidea), of which remains are found in the Miocene and Pliocene rocks of Europe and India.

Diocese, a term originally denoting a political division, transferred to ecclesiastical organization after the reorganization of the Roman Empire, and its formal conversion to Christianity by the Emperor Constantine. The term diocese now signifies a territory under the pastoral care of a bishop. In the Roman Catholic church the dioceses are erected by the Pope.

Diocletian (245-313 A.D.), emperor of Rome from 284 to 305, whose full name was Caius Aurelius Valerius Diocletianus. He was born of obscure parentage in Dioclea, in Dalmatia. He introduced a new system of government, whereby there were, in addition to the two emperors or *Augusti*, two *Cæsars*, or subordinate emperors. Each of the four was to govern absolutely a portion of the empire, and the decrees of each were to be binding on the others; all recognized Diocletian as the supreme head of the Empire. The *Cæsars* chosen were Constantius Chlorus and Galerius, who in 292 A.D. were solemnly proclaimed at Nicomedia in Bithynia. Diocletian is notorious for his severe persecution of the Christians, to which, it seems, he was reluctantly impelled by Galerius. Consult Gibbon's *Decline and Fall*.

Diodorus, Greek historian, commonly called SICULUS from his birthplace at Agyrium in Sicily, was a contemporary of Julius Cæsar and Augustus, and author of *The Library of History*. Written in Greek, it contained the history of the world from mythical times down to Cæsar's invasion of Gaul.

Diogenes, The Cynic (?412-323 B.C.), ancient Greek philosopher, was born in Sinope, in Pontus. He was attracted to the study of philosophy by Antisthenes and proceeded to practice the most rigid asceticism. Diogenes wrote nothing, but tried to inspire in those with whom he talked a disregard for worldly pleasures and conventions and a return to a simpler, more natural mode of life.

Diogenes Laërtius, a Greek author who lived probably about the end of the second

century A.D. He is known by his *History of Philosophy*.

Diomedes, or **Diomedes**, the successor of Adrastus as king of Argos, was one of the second Seven against Thebes, and was conspicuous in the Trojan War, in which he fought with success against Hector and Æneas.

Dion Chrysostomus (c. 50-117 A.D.)—that is, the 'golden mouthed'—Greek rhetorician, was born in Prusa, in Bithynia. He was the most eminent of the Greek rhetoricians.

Dionæa Muscipula ('Venus' fly-trap'), an herbaceous, carnivorous bog-plant of the order Droseraceæ, is a native of the Carolinas. It is a small plant, remarkable for the two sensitive limbs in which each leaf terminates. If a foreign object, preferably an insect, touches the upper surface, or a spine, of these limbs, the two halves promptly approach one another until the marginal teeth interlock, enclosing the insect. An acid juice is secreted by certain glands, dissolving parts of the prey, which are digested and absorbed before the leaf opens again.

Dione, according to some accounts one of the Titans, daughter of Oceanus and Tethys, or, according to other accounts, of Uranus and Ge. Beloved by Zeus, by him she became mother of Aphrodite.

Dionne Quintuplets. See **Quintuplets**.

Dionysia, festivals of the god Dionysus, held in many places in Greece, but especially in Athens, and celebrated with processions of bacchanals, mænads, and thyiads. From the end of the 6th century B.C. and onwards the great feature of these festivals was the production of tragic and comic dramas in honor of the god. It was at these festivals that all the great Greek plays were first represented.

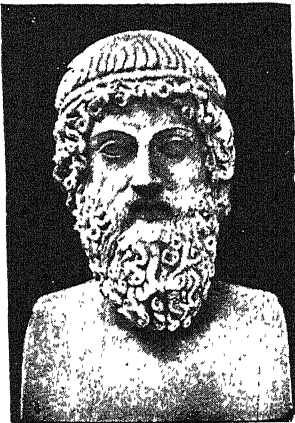
Dionysius Exiguus (named 'the Little'), chronologist and theologian, a Scythian by birth, who lived in the 6th century. He instituted the custom of dating events from the birth of Christ, and is also noted for his collection of canonical mss. of Scripture.

Dionysius of Alexandria (c. 190-265), bishop of Alexandria often known as 'the Great.' He followed Origen in his opposition to Chiliasm, developed the doctrine of the Logos as against Sabellianism, and denied the authenticity of the book of Revelation.

Dionysius of Halicarnassus, Greek historian and rhetorician, was born in Halicarnassus. He wrote an *Early History of Rome*, his chief work, which covered the period from the earliest times to 264 B.C. Only about one-half is extant.

Dionysius the Elder (c. 430-367 B.C.), was born in Syracuse, of which city he was tyrant from 405 to 367 B.C. His reign is chiefly remarkable for his wars with Carthage. His rule was oppressive to his subjects; the taxation in particular was very severe, but he made Syracuse one of the most powerful cities of its time. He held high literary ambitions and was himself a tragic poet, winning the first prize at Athens in 367 B.C.

Dionysius the Younger (396-c. 330 B.C.), was born in Syracuse, and succeeded his father (367 B.C.). When he came to the throne Dion and Plato tried unsuccessfully to make a philosopher of him.



Bust of Dionysius.

Dionysus, also called **Bacchus**, the Greek god of wine, son of Zeus and Semele, daughter of Cadmus of Thebes. The story of the god shows that his worship was regarded as a foreign importation. In its wild revelry it betrays an Eastern origin and symbolizes the reproduction and fertilizing forces of nature. Dionysus was attended by Silenus, Pan, satyrs, centaurs, and bacchanals; the latter were women, and bore various appellations. The wine, ivy, laurel, and asphodel were sacred to Dionysus, and various animals, such as the ram, dolphin, tiger, and panther.

Diopside, one of the pyroxene minerals. The finest crystals are found in cavities and fissures in metamorphic rocks. It is usually of a pale green color.

Dioptase, a bright-green mineral found in the Altai in Siberia, in Copiapo (Chile), and in Arizona; and on account of its color is known popularly as emerald copper.

Dioptrics and Catoptrics, those branches

of geometrical optics which treat respectively of reflection of rays from surfaces and refraction of rays through different media. See REFLECTION AND REFRACTION OF LIGHT.

Diorite, crystalline igneous rocks of the plutonic group, having in general a similar structure to the granites. They consist essentially of plagioclase feldspar, with a ferromagnesian mineral, which may be augite, hornblende, biotite, or hypersthene, or any mixture of these. Diorites are now being used for ornamental monuments, instead of granite. Diorites are abundant in Germany and North America.

Dip, in navigation, the difference of the altitudes of a star seen from two levels. The higher the place of observation the lower is the depression of the horizon, and therefore the 'dip' at a mast-head is greater than that observed on deck.

Dip, in magnetism, the inclination of the earth's magnetic force to the horizon. It is measured by means of a magnetic needle, known as the dipping-needle, delicately poised at its centre of gravity.

Dip, in geology, the inclination of the surface of the bedding planes, as measured in degrees, from the horizontal.

Diphtheria, an acute infectious epidemic disease caused by a specific microorganism, the Klebs-Löffler or diphtheria bacillus, especially common in children. Before 1826, when Bretonneau named it 'diphtheria,' it was called 'angina,' and it can be traced back in medical literature for eighteen centuries. It was not until 1883, however, that Klebs described, and Löffler isolated, the bacillus which bears their names; and it was only in 1894 that treatment by the subcutaneous injection of 'antitoxin,' which has greatly reduced the proportion of fatal cases, was worked out by the German Behring and the Japanese Kitasato.

Diphtheria is particularly prevalent in the autumn months, and shows marked cyclical variations over longer periods, often rising to a maximum every five or ten years.

The *Bacillus diphtheriæ* is a nonmotile, irregularly rod-shaped bacillus, characterized by a granular staining which makes it possible to recognize it under the microscope in cultures made from smears taken from the throat. It is sensitive to heat and is killed almost instantly by boiling. The germ enters and leaves the body by way of the nose and throat, and the disease is contracted by contact with the nasal or oral discharges of an infected person. The characteristic feature of the disease

is the appearance of a membranous exudate, beginning usually as small white patches on the tonsils. Antitoxin holds the chief place in the treatment of diphtheria. The most important measures to prevent the occurrence of diphtheria are cleanliness as to the secretions of the mouth, nose, and throat, and early attention in this respect to individuals who are freely discharging secretions. By a campaign of education in the early use of antitoxin in cases of diphtheria, the control of carriers, and the testing and immunization of children of school age, it is believed that the elimination of diphtheria may eventually be accomplished.

Diphthong, a conjunction of two vowels in a syllable to form one compound sound, as in 'coin,' 'mouse.'

Diplodocus, a fossil dinosaur, herbivorous and probably aquatic, which inhabited the marshes and swamps of Jurassic seas and lowlands. The peculiar arrangement of the vertebrae, with its system of plates and buttresses, give it its name, which means 'double-raftered.' The finest specimen extant is in the Carnegie Museum at Pittsburgh.

Diploma (Greek, 'something doubled'), originally a document on two tablets of wax or on writing material which was folded. The term is now chiefly applied to documents given by universities and other learned societies, in proof of the holder having attained a certain degree.

Diplomacy, the art of conducting the intercourse and adjusting the mutual relations of nations. Its necessity arises from the interdependence of modern states, and the rights and duties of political intercourse. Its practical rules are embodied partly in those international customs and usages which constitute what may be called common law, and partly in those treaties which may be regarded as international law.

The system of diplomacy is comparatively modern, not having existed in ancient times—the relations of Rome, for instance, with other powers having been confined to temporary embassies for occasional purposes; while during the Middle Ages, the pope, particularly after the supremacy of the church had been established, acted as a kind of mediator and go-between—as, for instance, repeatedly between England and Scotland in the time of Robert Bruce.

The diplomatic hierarchy, as fixed by the annex to the Treaty of Vienna in 1815, falls into three ranks: Ambassadors, Legates, or Nuncios; Envoys Extraordinary or Ministers

Plenipotentiary; *Chargés d'Affaires*. From the moment that a public minister enters the territory of the state to which he is sent, until he leaves the country, he is entitled to an entire exemption from the local jurisdiction, both civil and criminal.

General convenience early suggested the use of one language in diplomatic intercourse. For many centuries Latin was the ordinary medium of political correspondence, then Spanish. From the time of Louis XIV. until after the Great War it was French, but since that time both French and English have been about equally employed. The suspension of diplomatic intercourse usually precedes a declaration of war; it is also sometimes employed as a means to coerce a weaker state. In the United States its relations with foreign states are committed to the Secretary of State and the State Department.

Diplomatic Corps, the whole body of ministers who are present at any court as representatives of foreign countries.

Diplomatic Service, a governmental system of representation in foreign countries for the purpose of fostering friendly relations, protecting the rights of citizens abroad, and expanding foreign commerce.

The officials of the United States diplomatic service include ambassadors, envoys extraordinary, ministers plenipotentiary, ministers resident, commissioners, counselors, secretaries of embassies and legations, *chargés d'affaires* and agents. The duties of ambassadors, who are accredited to countries of the first importance, include personal representation of the head of the state, the negotiation of agreements between the United States and the countries to which they are accredited, and the study of political, social, and economic conditions. In emergency, diplomatic officers issue passports to American citizens, and facilitate the operation of extradition treaties. In China, Morocco, Turkey, Persia, and Siam they exercise judicial functions extending to the trial of civil cases between American citizens and of criminal cases in which American citizens are involved.

For the better performance of their duties, diplomatic officers enjoy certain immunities, among which is exemption from the civil and criminal jurisdiction of the country to which they are sent. This privilege to a great extent includes their household and suite. In the United States, in marked contrast with the practice of many other countries, appointments to diplomatic posts have been frequently governed by political services rather than

personal fitness. Under Presidents Roosevelt and Taft, efforts were made to apply the merit system by having the diplomatic service conform to the regulations established for other civil service. In 1924 these regulations were superseded by new ones which combined the requirements for the Diplomatic Service with those for the Consular Service as applied to a newly created position of Foreign Service officer. Some seventy-five universities and colleges in the United States claim to afford facilities for Foreign Service training but in the opinion of many prominent men in public life an Academy of Diplomacy would fill a real need. The diplomatic representatives of the United States are nominated by the President, subject to confirmation by the Senate. They are under the supervision of the Department of State. At present (1939) provision is made for nineteen ambassadors from the United States to foreign countries—namely, Argentina, Belgium, Brazil, Chile, Cuba, France, Germany, Great Britain, Italy, Japan, Mexico, Peru, Spain, Poland, Turkey, China, Colombia, U.S.S.R. and Venezuela.

The United States also sends abroad numerous envoys extraordinary and ministers plenipotentiary and secretaries of embassy or legation. For information concerning the consular service, see CONSULAR SERVICE.

Consult *Register of the Department of State; Information Regarding Appointments and Promotions in the Diplomatic Service of the United States* (published by the Department of State).

Diplozoon (Greek 'double animal'), a remarkable flat worm or trematode. One individual moors itself by its ventral sucker to a conical knob on the back of another, which thereupon so twists itself as to fix the first individual in the same manner. The cones and suckers are closely fused, but otherwise the secondarily twin animals remain independent. The two become permanently united in this curious double animal, and each becomes mature and capable of laying fertile eggs to begin the cycle anew.

Dipnoi, or **Dipneusti** ('double breathers'), a sub-class of fishes whose members possess both lungs and gills, and thus remain throughout life at the level of the tadpole. Among the internal peculiarities, the Dipnoi possess a spiral valve in the intestine—a primitive character; while, like amphibians, they have a three-chambered heart, multicellular skin glands, a pulmonary vein, and a vein called the vena cava, which is not present in other fishes. These characters are so striking that

some authorities would separate the Dipnoi from other fishes, and class them intermediately between fishes and amphibians.

Dippel, Johann Andreas (1866-1933), German tenor singer. In 1902-3 he appeared in concert in the United States, and in later seasons he was a member of the Metropolitan Opera House Company, New York City, and sang several leading rôles. He was director of the Chicago Opera Company, 1910-13.

Dipper, or **Water Ousel**, a genus of birds of the thrush family, distinguished by an almost straight, compressed, sharp-pointed bill, by the possession of a nostril valve, and still more by their characteristic manners and habits. They frequent clear pebbly streams and lakes, feeding chiefly on molluscs and on aquatic insects, which they seek even under water, diving with great facility, and moving about by help of their wings. Among the species may be mentioned *C. Mexicanus*, found in the mountains on the west side of North America from Alaska to Mexico.

Dipper, in the United States the popular name of the seven chief stars of the Great Bear (*Ursa Major*), which included originally only the seven stars of the Plough, or 'Charles' Wain.' See *URSA MAJOR*.

Dipping Needle and **Dip, Magnetic**. When a magnetized needle is carefully suspended by its center of gravity, it is found to set itself not only in a definite azimuth known as the Magnetic North, but also in a position inclined to the horizontal. In the civilized world north of the Equator, the north end of the magnetic needle points down or *dips*, and the angle the axis of the magnet makes with the horizontal is called the magnetic dip. The instrument specially constructed to determine the dip in any locality is called the dipping needle or dip circle. The magnetic dip varies in value from zero, that is horizontality, in the vicinity of the equatorial regions, to 90°, that is perpendicularity, at the magnetic poles in the North and South Hemispheres. The line drawn through all places having zero dip is called the *Aclinic Line*.

Dipsomania is a recurrent form of insanity, and consists in a paroxysmal craving for stimulants which impels its victim to indulge the propensity at all hazards.

Diptera, the flies, a large order of two-winged insects whose members are in some respects highly organized. The larvæ are usually maggots, grubs without feet and with an indistinct head—and frequently live on decaying animal matter; but many are parasitic.

tic on plants or animals. The adults are not infrequently blood suckers. About forty thousand species of Diptera have been described, including the Blow Fly or Blue Bottle, Daddy-long-legs, Gaddy, Gnat, House Fly, Midge, and Mosquito.

Diptych, a two-leaved writing tablet, on which were inscribed the names of living or dead Christians to be read aloud during the celebration of the Eucharist. The earliest diptychs in existence are not older than the fifth century of our era.

Dirce, wife of Lycus, king of Thebes, who married her after cruelly divorcing his former wife, Antiope. Antiope's sons by Zeus, Amphion and Zethus, fastened her to a wild bull, which dragged her about until she died. The group of sculpture known as the Farnese Bull, in the museum at Naples, depicts the vengeance taken upon her.

Direct Motion. In music this term means the progression of parts in a similar direction. In astronomy it denotes the apparent motion from west to east on the celestial sphere of a body belonging to the solar system.

Director. A director of a corporation is one of a group or board chosen by the body of shareholders to superintend the business of the company along the lines set forth in its articles of incorporation, and to select its executive officers.

Directorium, or **Ordo**, a list drawn up by authority of a Roman Catholic bishop, containing directions as to the mass and office to be said on each day of the year.

Directory, the executive government of France established in the year iv. (1795) of the Revolution. Power was vested in the hands of five men, Barras, Carnot, L  peaux, Latourneur, and Rewbell. Bonaparte came first into public notice as the defender of this constitution (insurrection of Vend  miaire, October, 1795).

Directory, an alphabetical list of the names, addresses, and occupations of the inhabitants of a town, city, or state. There are also special directories of persons engaged in particular professions and lines of business; of corporations and their directors and securities; and, in general, of any business or class of persons whose importance demands a popular available knowledge.

The first London directory was printed about 1677; the first directory in the United States appeared at New York City in 1786.

Directory of Public Worship, a body of rules for the conduct of public worship, drawn up by the Westminster Assembly of Divines,

accepted by the English Parliament (1644), and similarly received by the General Assembly of the Church of Scotland and by the Parliament of Scotland (February, 1645).

Direct Primary. See **Elections**.

Dirge, a song or hymn of mourning, particularly one sung over the dead.

Dirigible Balloons. See **Balloons**.

Dirk, the Highland dagger. Its characteristic features are a long, sharp-pointed blade, triangular in section and thick backed; a cylindrical handle without a guard, but having a 'shoulder' at its junction with the blade, and a circular, flat-topped pommel.

Disability, legal incapacity to do a particular act—a person under the age of twenty-one is legally incapacitated from entering into binding contracts.

Disappointment, Cape, the s.w. extremity of the State of Washington, on the north side of the estuary of the Columbia River. It has a lighthouse with red and white lights, 230 feet above sea level.

Disarmament, a term formerly used of the reduction of the military and naval forces of a nation from a war to a peace basis, but more recently employed in connection with the movement for the limitation of armament by international agreement. The extent of such limitation is a matter of debate. In general it may be said to imply a gradual reduction in the armament of the nation to the point when only enough for police purposes will be retained. The vision of a world without war is an ancient one, dating back to the time of the old Hebrew prophets, who looked to a day when men should learn war no more but should 'beat their swords into plowshares and their spears into pruning-hooks.' Disarmament as a means for bringing about this great ideal is a more recent conception. At the First Hague Conference in 1899 the question of limitation of armaments was discussed at length. The question was again brought up at the Second Hague Conference in 1907, but Russia and Germany refused to discuss it at that time as leading to no practical results. The last movement for the limitation of armaments was, without question, an outgrowth of the Great War. One of President Wilson's Fourteen Points of Peace was: 'Adequate guarantees given and taken that national armaments will be reduced to the lowest point consistent with domestic safety;' and the principle was included in the Treaty of Paris. Article 8 of the Constitution of the League of Nations recognizes the desirability of 'the reduction of national armaments to the lowest point

consistent with national safety and the enforcement by common action of international obligations.' With the exception, however, of the forcible disarmament of Germany, no definite step had been taken under the Treaty to bring about a limitation of armaments when President Harding, on July 10, 1921, sent out an informal invitation to Great Britain, France, Italy, and Japan to participate in a formal conference on the subject. For a discussion of the conference, see *LIMITATION OF ARMAMENT, CONFERENCE ON*.

This was the beginning of various conferences and resolutions internationally important in the effort to avoid armaments as a cause of war. The main difficulty was the insistence of various nations on what they deemed necessary for domestic peace policing. Limitation of arms has become the important international question rather than disarmament.

In 1927 the failure of the conference convened by President Coolidge showed the technical difficulties as to deciding on quantity of arms necessary to different nations. The League of Nations Commission spent great time on this point to no definite avail: The Five Powers Conference in 1930 which was held in London as a result of the commission's studies broke down twice before resulting in a three-power pact by which Great Britain, the U. S. A., and Japan undertook to reduce their capital ships to a ratio of 5-5-3, respectively. Japan, however, subsequently put forth a claim to full equality in naval armaments, and as a result of this attitude other conferences after 1930, including that of Geneva in 1934, were inconclusive. In 1935 Japan gave formal notice of her abrogation of the Washington treaty. At the London Conference of 1935-36, Great Britain, France and the United States entered into a treaty to limit certain classes of war ships, but as the treaty contained escape clauses to be invoked in case of over-building by non-treaty powers, it was soon left mainly without effect as the rearmament movement became active among all the great powers.

The great arguments in favor of disarmament are the tremendous costs of preparedness for war. The economic cost alone is staggering. Sir Frederick Maurice, military expert, has said, 'Armaments are ineffective as insurance against war, because increase of armaments in one state produces corresponding increase in other states, and then comes the temptation to make use of these powerful weapons.'

On the other hand, the opponents of dis-

armament claim that to limit armaments is no assurance of peace; that disarmament is merely a beautiful ideal and that, so long as human nature endures, a display of force is absolutely necessary to prevent lawlessness, violence, and crime. They also bring forward economic arguments—the great moral influence of military and naval backing in the industrial and commercial life of the nation.

The literature of the subject of disarmament—particularly the periodical literature—is extensive. Consult J. W. Wheeler's *The Reduction of Armament*; P. J. N. Baker's *Disarmament*; C. Morison's *The Outlawry of War*; compare also Vera Brittain's *The Testament of Youth*.

Disbar, a term meaning to deprive an attorney of his right to practice on account of professional misconduct or conviction of crime.

Disc, in botany, is a term applied to modified regions of the floral axis.

Discalced, or **Discalceate**, the technical term for certain friars and nuns bound by rule to go barefoot.

Discharge, the term regularly applied to dismissal from the U. S. Army or Navy. Three forms of discharge are issued: (1) *Honorable discharge* granted to any persons whose term of service has been served with fidelity. (2) *Ordinary discharge* granted to those who are not recommended by their superior officer for fidelity, or who are discharged before the end of their term at their own request; (3) *Dishonorable discharge*, given by sentence of a general court martial.

Disclaimer, a legal term, used of the renunciation of some right or interest, as when a person refuses to accept the trusteeship of an estate; of the denial of tenure by a tenant. of renunciation, in writing, by a defendant, of any connection with the matters set forth in the complainant's bill. In patent law a written statement by a patentee, disclaiming certain statements made erroneously, but without intent to defraud, in his first application, is called a disclaimer.

Disco, an island off the western coast of Greenland. It contains much excellent coal. Godhaven Harbor, on the southern coast, is a place of call for whalers.

Discord, in Music, is a combination of notes which leaves the ear unsatisfied unless it is followed by further combination.

Discount, a term most commonly used, in a technical sense, in connection with the sale of bills of exchange due at a future date; and presently sold for cash. To specially favored

customers, or to customers buying large quantities, a price less than the published or listed price may be charged, when the purchaser is said to receive a discount.

Discovery. See **Exploration.**

Discovery in judicial practice signifies the revelation and production of material facts and documents, which may be required from a defendant by a court of equity.

Discrimination in rates See **Railroads, Government Regulation.**

Discursive, the term applied to a type of intellect or thinking which reaches truth by a gradual process

Discus, an implement used in the athletic games of the ancient Greeks and Romans, used for throwing to the greatest possible distance as a test of strength and skill. It was a circular plate of stone or metal. The method is well shown in the celebrated statue of the *Discobolus*, disc thrower, by Myron.

Disease, any marked deviation from normal health of the mind or body.

Disestablishment, the withdrawal of the church from its political connection with the state, is a question of importance in several of the countries of Europe. In France the state church, Roman Catholic, was disestablished by an act of December, 1905. In Spain this was one of the Revolutionary reforms.

Disfranchisement, as commonly understood, is the act of depriving a person of the rights and privileges of citizenship. A persistent endeavor to eliminate the negro voter has been made in a majority of the Southern States. After the downfall of the 'carpet-bag' governments in the reconstructed States, the whites succeeded in greatly reducing the negro vote through intimidation and other illegal methods, although the Fifteenth Amendment appeared to place an insuperable bar in the way of the legal disfranchisement of the negro. The provisions of law, fairly executed, barred illiterate whites and blacks alike; in practice, it was applied to the negroes only. Consult Smith's *Negro Suffrage in the South* (1914); Porter's *History of Suffrage in the United States* (1918); Farley's *Statistics and Politics* (1919).

Disinfectants are, in a strict sense, those agents which can prevent infectious diseases from spreading by destroying their specific poisons. Disinfectant agents may be either physical or chemical. The most efficient of all disinfectants is *heat*. The boiling temperature in water kills the ordinary disease germs in five minutes. Chemical disinfectants

are practically the most important, aside from heat. These substances in general destroy the bacteria by entering into chemical combination with their body-substance. The process has been shown by Krönig and Paul, Chick, and others to follow the laws of ordinary chemical reactions.

Disinfection, the destruction of the germs of infectious disease, as opposed to *sterilization*, the destruction of all living germs whatsoever. *Antiseptics* are substances which restrain the development of microbes of any class without destroying them.

Disinfection once meant chiefly room disinfection—the application of some gaseous substance which would destroy the germs scattered about in dust or on the surfaces of the room and its furnishings. Less and less emphasis has been placed on this type of disinfection, however, as modern knowledge of bacteriology and epidemiology has shown that disease germs perish rather rapidly on leaving the body, particularly if dried, and that the chief danger of infection lies in the direct transfer of the fresh excreta of the sick. Attention is therefore concentrated on the patient and his excretions. Consult Chapin's *Sources and Modes of Infection*, 1910.

Dislocation, in surgery, denotes the displacement from each other of the articular portions of the bones forming a joint, with or without fracture of the bone.

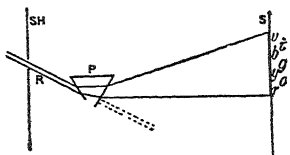
Dismal Swamp, large coast marsh lying in the southeast of Virginia and the northeast of North Carolina.

Disney, Walter E. (1901–), cartoonist, was born in Chicago. After service in the Ambulance unit in the World War, he became a commercial artist and in 1920 a motion picture cartoonist. He developed the scheme of combining photography with cartoons, and since 1928 has been producing the Mickey Mouse and Silly Symphony cartoons. His longer pictures include: *Snow White and the Seven Dwarfs* (1938), *Ferdinand the Bull* (1939), *Fantasia* (1940), *Dumbo* (1941), *Bambi* (1942), *Victory Through Air Power* (1943).

Dispensation applies technically to the remission of certain obligations by ecclesiastical authority. Besides the Pope, only bishops, except in specified cases, may dispense as Papal delegates. In the English Church, the Archbishop of Canterbury grants special dispensations.

Dispersion is the separation by refraction of the constituent rays of a beam of non-

homogeneous light. The colors of the rainbow and the dew-drop are familiar examples of the effect of dispersion. The nature of the phenomenon was first clearly expounded by Newton.



Dispersion of Light.

sH, shutter; R, ray of white light; P, prism; S, screen, with colored rays—v, violet; i, indigo; b, blue; g, green; y, yellow; o, orange; r, red.

Displacement, the weight of water, measured in tons, displaced by a ship at her load draught.

Disputation, a word used to denote an exercise in which parties formally sustain, attack, and defend a question or thesis.

Disraeli, Benjamin. See **Beaconsfield.**

Dissection means cutting apart, and the term is applied in all branches of biology to the study of the structure and relations of the various anatomical elements of an organism by removing connective and enveloping tissues, and so isolating the component parts. Dissection has, however, assumed its greatest importance in the study of human anatomy. While Hippocrates and his school had some slight knowledge of the subject, it was not until after the Renaissance that the systematic study of human anatomy by dissection brought that science within the domain of medicine. Even then the prejudice against the desecration of the human body compelled many to depend for their knowledge on the dissection of lower animals. Until the nineteenth century the difficulty in procuring 'subjects' was the most formidable bar to progress. Early in that century acts were passed which provided that the bodies of unclaimed dead should be handed over to medical schools for the purpose of instruction.

Dissociation is the name given to those 'balanced' or 'reversible' chemical actions in which one at least of the acting bodies is a gas. The decomposition on heating of nitrogen peroxide, N_2O_4 , into the simpler NO_2 molecules, and the re-formation of the original substance on cooling, is a typical instance of this kind of action.

Dissonance, in music, is a combination of sounds which produce ears.

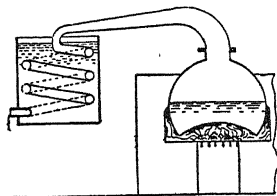
Distaff, a staff or stick to which flax, cotton, or other substance to be spun was fixed in the hand mode of spinning.

Distemper, the method of painting usually employed before the introduction of an improved oil medium early in the 15th century, consisted in mixing powder colors with water and size, white of egg, or other binding material of a glutinous nature, and applying them to a panel or canvas prepared with a coating of plaster or *gesso*, the prepared surface being perfectly dry.

Distemper. One of the worst dog diseases. See Dog.

Distich (Gr. *distichon*), a couple of verses making complete sense by themselves and enshrining some moral or epigrammatic thought. Strictly speaking, a distich should consist of a hexameter and a pentameter.

Distillation. The term 'distillation' was formerly applied to the separation of spirituous liquors from the liquid produced by the fermentation of sugary solutions, but has now a far wider application. When many liquids and solids are heated they are con-



Simple form of Still.

verted into vapor, which is condensed again on cooling. The vessel in which the material is heated is called the still or retort, which is connected through a still-head to a cooling-chamber called the worm or condenser, from which the condensed liquid, or *distillate*, runs into a receiver. The temperature of the change into vapor varies widely with the substance. *Destructive* or *dry* distillation takes place when substances that do not evaporate unchanged are heated to a temperature high enough to decompose them into compounds that are volatile, as in the manufacture of coal-gas and shale-oil.

Distress. The taking without legal process of goods for the purpose of constraining the owner to pay a claim or perform some act. This extra-judicial remedy is an ancient form of self-help, having been in common use in England in the thirteenth century.

Distribution. See **Economics.**

Distribution, Statutes of, are the acts which provide for the division of the surplus of the personal estate of intestates. These differ in different countries and in the United States in different States.

Distribution of Animals and Plants. See **Geographical Distribution.**

District of Columbia. See **Washington.**

Distringas, at common law is a writ requiring the sheriff to distrain, that is, to seize the goods of the person sought to be coerced. By this form of process an obdurate defendant could be stripped of all his goods if he did not appear.

Ditch, in military fortifications that part of the defence works outside of the main wall, generally filled with water.

Ditmarschen, marshland coast region of Germany, extending n. from the mouth of the Elbe to the Eider; inhabited during the middle ages by a liberty-loving race, of mixed Saxon and Frisian descent, finally defeated and subjugated by the Duke of Holstein and King of Denmark in 1559.

Dithyrambus, or **Dithyramb,** name given by the ancient Greeks to a hymn sung at vintage festivals in honor of Dionysus, the god of wine. It was sung to Phrygian music and accompanied by the flute, and was chanted by a chorus with dance and gesture.

Dittany. In America, the labiate herb *Cu-nila origanoides*. It is aromatic and furnishes a carminative and sudorific drug.

Diuretics are agents which increase the secretion of the kidneys.

Divan, or **Diwan,** a Persian word, applied to a senate or council of state and to a collection of poems with the rhymes in alphabetical order. The word 'divan' is also used of the audience chamber in Oriental palaces, and of its low cushioned seats; hence, at present, it is any low cushioned seat.

Diver, or **Loon** (*Colymbus*), a genus of birds of the family Colymbidæ, emphatically oceanic, and confined to northern latitudes. The Great Northern Diver or loon, also called the immer or ember goose (*C. glacialis*), is a bird about 2¾ ft. long, exhibiting no little beauty of plumage. Its cry is very peculiar and wild, has been likened to the howl of a wolf.

Dives (Lat. 'rich'), the name popularly given in literature to the rich man in our Lord's parable of the rich man and Lazarus.

Divide, geographical term signifying the high ridge between two valleys forming the water parting. Thus the 'Continental Divide'

is the name given to the snowy range of the Rocky Mountains.

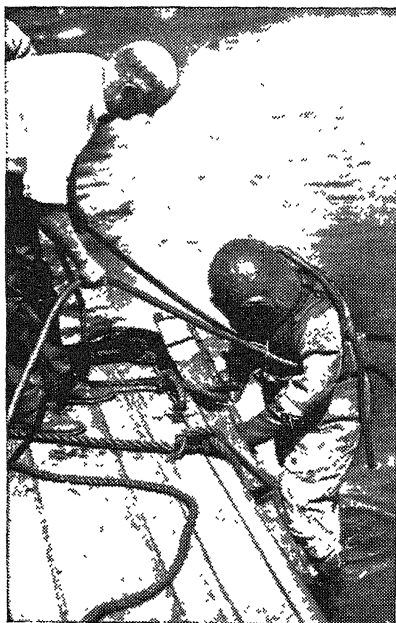
Dividend is the amount of interest or profit distributed to the shareholders or stockholders in a company. Preference shares are entitled to a fixed rate of interest before anything is paid to the ordinary shareholders. In American corporation finance there may be first preferred, second preferred shares, etc., dividends being paid in order of preference. The declaration of dividends is one of the powers of directors. 'Extra' dividends are declared when the regular ones do not exhaust the profits from earnings. The term is also used to signify the proportionate share which a creditor who has succeeded in proving his debt receives out of a bankrupt estate.

Divination, the act of obtaining the knowledge of unknown things of the past, present, or future by supernatural revelation. It is based upon the belief that the divine thought may be comprehended by the human understanding in a knowledge of a special nature through supernatural means, with or without the concurrent agency of reason. A broad distinction may be made between *artificial* divination by haruspication, astrology, lots, the interpretation of prodigies, lightning, augury, and the like; and *natural* divination, by dreams and prophetic oracles, considered as the direct revelation of the divine will, or an inward intuition flashed with irresistible conviction upon the human soul.

Divine Right, a term applied to describe the source of the power claimed for the monarch, by the royalist party, in the great controversies between the monarchical and commonwealth parties in England in the seventeenth century. The monarch was held to be the immediate representative of the Deity, to whom alone he was responsible for all his actions. The practical adoption of the principle of divine right by Charles I. of England was the most important factor in leading to the Civil War of 1642.

Diving, in its original sense the act of plunging headforemost into the water; by extension, any of the modern forms of descent into the water for industrial purposes, as sponge and pearl fishing, harbor, dock, pier, and breakwater construction, bridge building, wreck raising, recovering sunken cargo, repairing submarine cables, etc. The earliest contrivance of this character was the diving bell. The first practical diving bell was devised about 1720 by Dr. Edmund Halley. The bell itself was of wood, loaded with lead to

keep it perpendicular in its descent, and was made in the form of a truncated cone, with a capacity of 60 cubic ft. Casks lined with lead and filled with compressed air were also sunk, and from these a supply of air was drawn into the bell by means of a leather hose. The form of diving bell now in use is based upon that devised by John Smeaton in



A Diver, equipped with suit and helmet.

1788. Air was supplied by an air pump and was carried to the divers through a hose connecting with a valve in the top of the bell. The modern diving bell is of very similar construction.

In modern practice the diving bell has been largely superseded by the diving dress, invented in 1829 by Augustus Siebe. In the diving dress invented by Fleuss in 1880, the diver is independent of supplies of air from above. Modern diving dress, constantly being improved, is fastened to the back of the diver, who carries a supply of compressed oxygen, regulated at will by a jamb screw-valve. The carbonic acid exhaled by the diver is absorbed by caustic soda in a receptacle fixed above a copper cylinder, while the nitrogen is breathed over and over again. In this dress, which weighs about 26 pounds, and can be adjusted, a man may remain below the surface for hours without harm.

Divining Rod, a wand or staff, usually of hazel wood forked at one end, but sometimes of metal, supposed to have the power of indicating the presence of minerals or water beneath the surface of the earth. On nearing the concealed spring or ore deposit, the operator is understood to experience a strong tremor, which communicates itself to the rod, which points to the precise spot. Divination by the action of wands or small sticks is still practised.

Divisibility, in the theory of numbers, is that property of any number whereby it may be divided by another without remainder.

Division, one of the four elementary operations of arithmetic by which one of two factors of a number may be found when the product and the other factor are known.

Division, a tactical and administrative unit which is the basis of army organization, forming a complete body in itself, commanded by a major-general. In time of peace the division is the largest permanent unit in the United States Army. During the Great War many of the divisions in the U. S. Army came to be known by distinctive names, more or less descriptive of their characteristics: Thus, the 26th Division composed of National Guardsmen from New England was known as the Yankee Division; the 31st, as the Dixie Division; Far Western troops, as the Sunset Divisions; the 42d, of National Guard units from twenty-seven States, as the Rainbow Division.

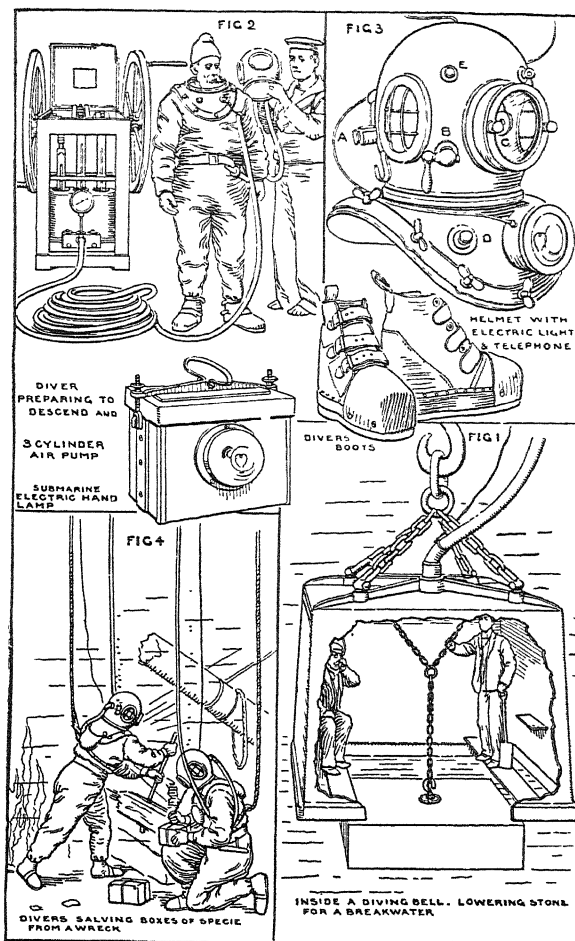
Division of Labor, in economics, is of three kinds: According to *time*, thus enabling work to be carried on continuously, interruption often meaning serious loss; according to *place*; according to *person*, the most familiar form; typified in Adam Smith's instance of the nine or ten persons whose combined labors of eighteen operations were necessary to produce a pin. The advantages of the principle are many. On the other side, certain disadvantages have been pointed out. They may be grouped as industrial, moral, physical. The industrial disadvantages arise when there is any sudden change or convulsion in industry. An individual or a district has specialized in one industry, and a change of fashion or the invention of a new machine renders their special gift or facility useless. The moral drawbacks arise chiefly from the monotony of the work. The physical arise partly from monotony. Factory legislation has done much to remedy these.

Division of Labor, in biology, a conception borrowed from economics and intro-

duced into biology by Milne-Edwards to describe the difference of function exhibited by the individual members of an animal colony, or by the different organs, tissues, and cells of a single organism.

Divorce. The legal dissolution of the marriage tie. Strictly speaking, the term is ap-

law been freely permitted, sometimes under certain restrictions as to the existence of sufficient cause or as to the form of procedure to be employed, often without formality, by mere agreement of the parties; or, in some instances, at the will of the husband, more rarely at the will of the wife alone. The



Diving Apparatus.

plicable only to a dissolution of a valid marriage for a cause which has arisen subsequent to the establishment of the connubial relation, a judicial decree of the nullity or invalidity of the marriage bond being the proper proceeding where a cause antecedent to the marriage is established. Divorce has in most ancient and non-Christian systems of

modern attitude toward divorce, which has prevailed throughout the Christian era in Western Europe and America, is due to the sacramental character of the marriage relation as established by the Mediæval Church. For centuries no divorce was permitted, even adultery giving cause only for a separation *a mensa et thoro*. The ecclesiastical view of

marriage and divorce yielded slowly to the conception of marriage as a civil institution and of divorce as a matter for civil regulation in the interests of the parties affected thereby, as well as of the community at large.

Up to the middle of the last century divorces could be pronounced only by act of Parliament in England, and in most of the United States only by the legislatures of the several States. Since that date, however, the power of dissolving the marriage tie for reasons declared by statute has in both countries, as well as in the self-governing British colonies and in all the non-Catholic countries of Europe, been vested in the courts. The grounds for divorce vary considerably in different States. The more conservative jurisdictions, like New York, which permit a divorce only for the cause of adultery, are matched by the extreme laxity of other jurisdictions, which recognize a 'settled aversion' of husband or wife for the other, or 'incompatibility of temper,' or 'inability to live in peace and union' as sufficient grounds for the dissolution of the marriage tie. Adultery of either party is a ground for divorce in all the States, and in most States habitual cruelty and wilful desertion for one or more years are also recognized as adequate grounds. Such breaches of marital duty as the refusal of the wife to cohabit with the husband, the failure of the husband to provide properly for the wife, habitual drunkenness of either party, gross misbehavior or wickedness, gross neglect of duty, as well as incurable insanity, ungovernable temper, etc., are among the causes on which a decree of divorce may be based in one or more of the States.

When the wife is the petitioner she is, both in England and the United States, entitled to include in the action a petition for permanent support after the granting of the divorce, known as alimony. The petition, whether presented by the husband or the wife, may also ask for a decree awarding to the petitioner the custody of the children. In England and in some States of the United States a provisional decree of divorce is first granted, the final decree following after a prescribed period of time, if in the meantime no new facts affecting the right to a decree be submitted and no reconciliation be effected. Pending the final decree neither party may marry again. In New York and some other jurisdictions the final decree forbids the guilty party to marry again during the lifetime of the injured party without permission of the court granting the decree. If a divorced party

remarry contrary to a decree forbidding it, he is subject to punishment for contempt of court. But such violation of the court's decree does not affect the validity of the divorce. A divorced person who is forbidden to remarry by the laws of the State which granted his divorce sometimes remarries in another State. Whether he is subject to punishment for contempt of court if he return to the State which granted the divorce, is a moot question. Some courts have held he cannot be punished, on the ground that the contempt of court was committed outside of its jurisdiction.

Jurisdiction in divorce proceedings depends on the domicile of the parties. Where husband and wife make their home in the same State, that State has jurisdiction. Where they are living separate, since the domicile of the wife is that of her husband, the husband's domicile determines the jurisdiction. But where the wife is living apart from her husband in another State and makes her home there, she is said to have acquired a *separate* domicile for the purpose of securing a divorce; and the courts of the State where she resides may take jurisdiction. Aside from these general considerations, statutes in many States require residence therein for a definite period of time, usually from six months to a year, before the courts will take jurisdiction.

For some years past attempts have been made in the United States to do away with the differences in divorce laws by committing divorce legislation to the national government by an amendment to the Constitution, or by securing uniform legislation by the several States. In 1932, (latest census records), for the United States as a whole, 6.1 marriages for each divorce were reported. The District of Columbia and New York State, each having but one cause for absolute divorce, reported 35.3 and 21.4, respectively, while the rates in other States ranged from 15.4 marriages to each divorce in West Virginia to 1.8 marriages to each divorce in Nevada.

The migration of wealthy Americans to Paris to obtain divorces led to a comparatively rigid stiffening of French law as regards time of residence required, causes, etc., which has somewhat cut down the number of those seeking divorce there. Recent Mexican laws making divorce of non-residents as well as residents easy, with the briefest period of residence, resulted in a rush of Americans to obtain immediate divorce, which has been somewhat checked by the fact that Mexican

divorces are not recognized in many States of the Union.

Dix, Dorothea Lynde (1802-1887), American philanthropist, was born in Worcester, Mass. She obtained many improvements, and brought about legislation establishing psychopathic institutions in a number of the States. Besides several books for children, she published *Prisons and Prison Discipline* (1845).

Dix, John Adams (1798-1879), American general, was born in Boscawen, N. H. He entered the army in the War of 1812. He was elected to the N. Y. State legislature in 1842, and was U. S. Senator in 1845-9. Later, he held the offices successively of assistant treasurer at New York, city postmaster, and Secretary of the Treasury. He was minister to France in 1866-9, and Governor of New York in 1873-5.

Dix, John Alden (1860-1928), American manufacturer and public official. He was a member of the firm of Reynolds & Dix, dealers in black marble, and became interested also in the lumber business. He was actively interested in the conservation of forests, and was instrumental in having established in New York State one of the best nursery systems in the country. He was forty-first governor of New York in 1910-12.

Dix, Morgan (1827-1908), American clergyman, rector of Trinity parish, New York, gained high reputation as a preacher. He published *History of Trinity Church* and other works.

Dixie, Lady Florence (1857-1905), English poet, novelist, and explorer, youngest daughter of the seventh Marquis of Queensberry, was born in London, and started an eventful career by exploring Patagonia, 1878-9, also acting as war correspondent for the *Morning Post* in the S. African War. She was mainly instrumental in the release of Cetewayo and his return to Africa. Her works include *Songs of a Child*; *Across Patagonia* (1880); and *Eilabelle, or the Redeemed* (1904).

Dixie Land, or Dixie. A popular song by D. D. Emmett and first given at Bryant's Minstrels in New York in 1859 or 1860. Though of Northern origin, it became the most popular Confederate war song during the Civil War. The name Dixie, associated with the territory s. of Mason and Dixon's Line, is of uncertain origin.

Dixon, James Main (1856-1933), English-American teacher, born at Paisley, Scotland. He went to Japan, where he was pro-

fessor of English at the Imperial University. He then came to the U. S. to accept a similar chair at Washington University. In 1911 he was transferred from English Literature to the Chair of Oriental studies and comparative literature at the University of Southern California. He is the author of *A Dictionary of Idiomatic English Phrases* (1890).

Dixon, Joseph Moore (1867-1934), American legislator; representative, Rep., in Congress in 1903-07; U. S. Senator 1907-13; Governor of Montana 1921-25; first assistant Secretary of the Interior 1929.

Dixon, Thomas, Jr. (1864-), American author, was born at Shelby, N. C. He was admitted to the bar in 1886; the same year entered the Baptist ministry. He published many books. *The Clansman* was dramatized and produced as *The Birth of a Nation* (1915); *A Dreamer in Portugal* (1934).

Dixon Entrance, a strait between Queen Charlotte Islands, B. C., and Alexander Archipelago.

Dnieper, or Dnyepyr, river of Russia, rising in Smolensk gov. Flowing s., at Smolensk it becomes navigable, and it eventually makes its way to the Black Sea.

Dniester, riv. of s.w. Russia, rising in Galicia, reaches the Russian frontier w. of Khotin.

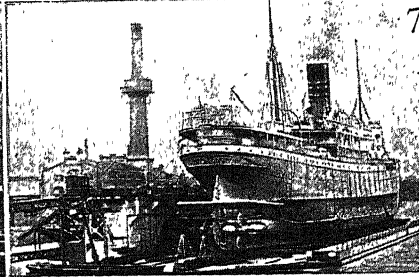
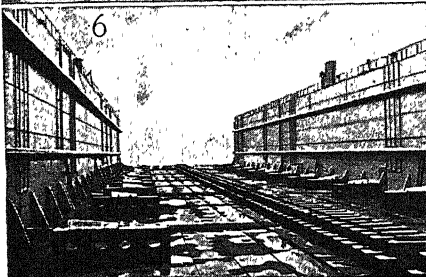
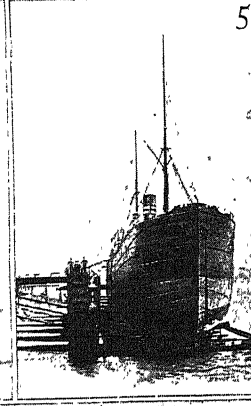
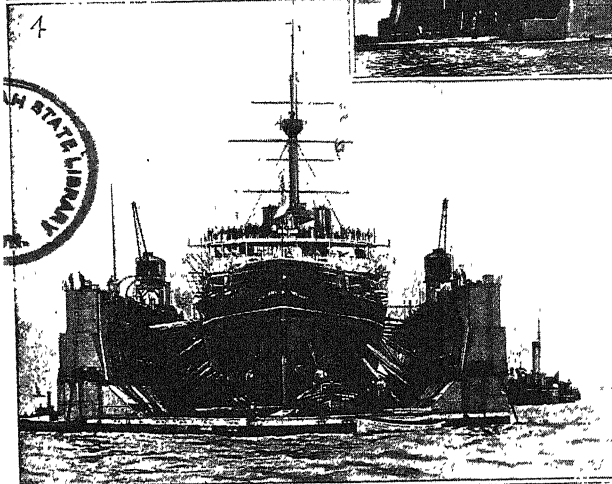
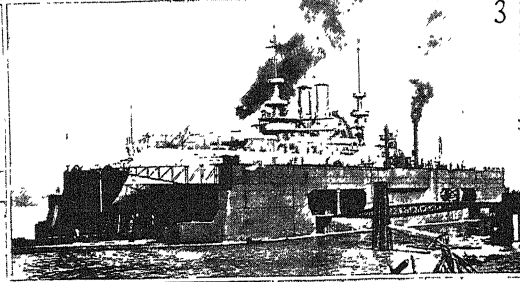
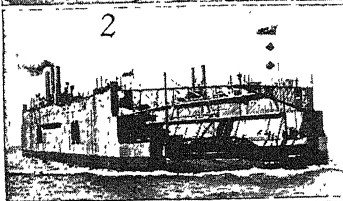
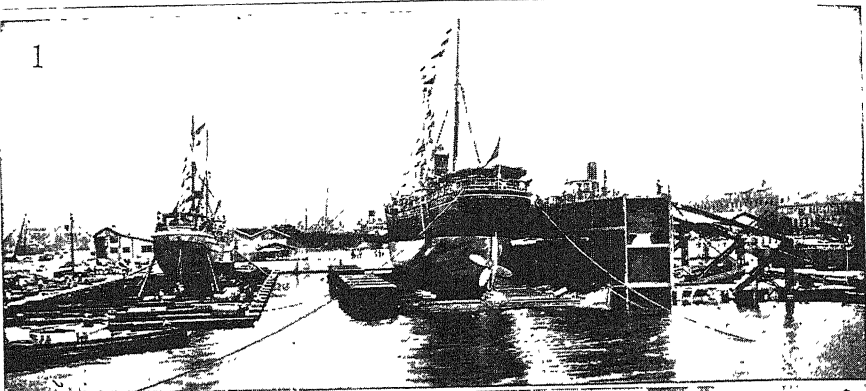
Doab, a tract of country in the United Provinces, India, is well irrigated, produces much wheat, and is very thickly populated.

Doak, William Nuckles (1882-1933), American labor union official and Secretary of Labor, was born at Rural Retreat, Wythe co., Virginia. President Hoover appointed Mr. Doak to succeed Senator James J. Davis as Secretary of Labor. One of his first official actions was to put into effect the deportation of undesirable aliens.

Doane, George Washington (1799-1859), American clergyman, born Trenton, N. J., was associated with Bishop Hobart in Trinity Church, N. Y., and with Bishop Uphold in founding St. Luke's in that city. Afterward he became bishop of New Jersey. He published *Songs by the Way* (1824) and other pieces.

Dobbs Ferry, vil., Westchester co., N. Y. It was here that Washington met Carleton and Clinton, to settle the terms of recognition of American independence.

Dobson, Henry Austin (1840-1921), English poet and essayist. Dobson first won a literary reputation in the 'seventies with a number of delicate and tender verse studies. He also took part in the revival of the old French form of verse—the *villanelle*, *rondeau*,



Floating Docks.—1. Depositing dock, Barcelona. 2. Floating dock, Durban. 3. Government floating dock, New Orleans. 4. Bermuda floating dock. 5. Offshore dock, Cardiff. 6. Floating dock, Port Mahon. 7. Offshore dock, Hamburg.

ballade, and the like. Poems: See *Collected Poems* (1 vol., 1897). Prose works: *Hand-book of English Literature* and biographies of *Fielding*; *Goldsmith*; *Walpole*; *Hogarth* and others; *A Paladin of Philanthropy*. *Bibliography* by F. E. Murray (1900).

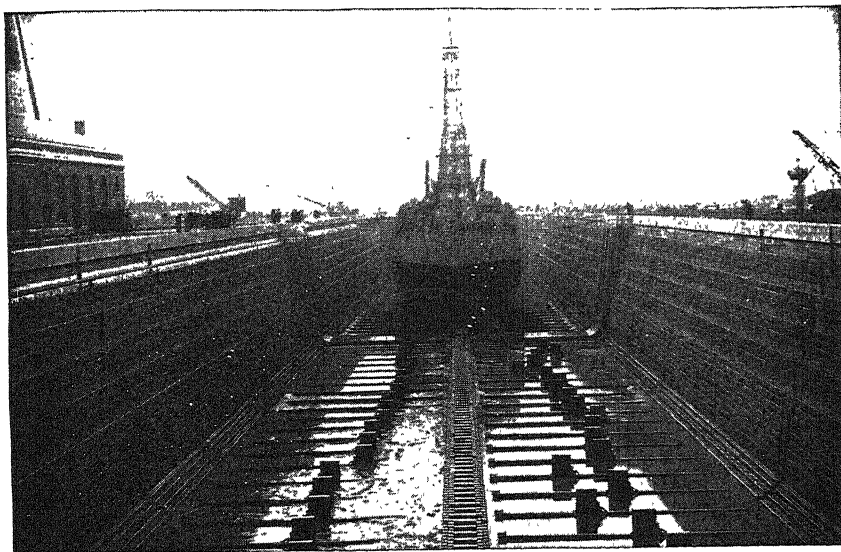
Dock, a name applied to several varieties of large perennial herbaceous plants of the genus *Rumex*, which includes also the sorrels.

Docket, an abstract or record of a trial or other judicial proceeding; also the book containing such records.

Docks and Dry Docks. A dock is a basin of water in an artificial enclosure, usually

enough to require such a provision. In European practice such docks are called 'wet docks' to distinguish them from 'dry docks.'

The general practice is to make the line of entrance to a dock at right angles to the current outside. The wet docks at Liverpool are on the largest scale of any in the world. A dry dock is a structure into which a ship may be floated and then laid dry for repair or inspection. Dry docks are of two types, (1) graving docks, which are excavations in the shore enclosed by walls and floored and provided with a gate or a floating caisson which closes the dock and permits its emptying by pumping, and (2) floating docks, which



Commonwealth Dry Dock, Boston, Mass.

excavated from the shore and confined by walls, into which ships may be floated for the purposes of loading, discharge, or repair. The term is often used, however, to mean the pier or quay adjacent to or surrounding the dock proper, and may be applied to the combined dock and pier. In the United States this inclusive meaning is generally accepted; in Europe, on the other hand, the term 'dock' usually refers strictly to the basin of water; it is customary there in harbor practice to have an entrance to one or more piers or quays so as to maintain a constant level in the berthing area and thus avoid the disadvantages of a changing tide. Tide variations in the United States are, as a rule, not great

are floating structures of wood, steel, or reinforced concrete, provided with watertight compartments which permit of their submergence. The ship enters the structure when the latter is submerged, and is raised above water by pumping out the compartments.

By far the most serious matter in the location and the design of graving docks is the foundation. The size of graving docks has increased with the enlargement of the ocean liner, until now there are a number known roughly as '1000-ft. docks,' which are capable of handling any vessel now afloat. Such docks have been built at Liverpool, Boston, Philadelphia, Quebec, Balboa, Charleston, San Francisco. Pearl Harbor (Hawaii), Victoria

(B.C.), Portsmouth, and Newport News, Va. It is difficult to say which of these is the largest, for no one has the greatest length, width, and depth combined. The docks at Boston and Levis, Quebec, however, come nearest to the record, with inside lengths of 1,140 and 1,150 ft., respectively, widths at the entrance of 120 ft., and drafts of 45 ft.

Floating dry docks furnish a means whereby vessels may be removed from the water for examination, cleaning, painting, and repair of the outside of the hull; but whereas all of the water must be pumped or run out of a graving dock, a floating dock is a movable structure capable of lifting the ship out of the water and supporting it by virtue of the dock's own buoyancy. The chief advantage of a floating dock is its mobility; it can be built in the cheapest and most convenient place, and then towed to its destination, as in the case of the United States dry dock *Dewey*, constructed by the Maryland Steel Co. at Sparrow's Point, near Baltimore, and towed to the Philippine Islands. The floating dock at Singapore is another famous modern floating dock.

An early American patent for a floating dock was granted in 1816, to J. Adamson, for a wooden structure, with flat bottom, vertical sides, and gates at one end, through which the vessel could be floated. The water was then pumped out and the vessel inspected. With the exception of the gates, this shape of dock is retained today. Later sectional dry docks were developed. The modern floating dock in its simplest form consists of a hollow box or 'pontoon,' forming the buoyant or lifting portion, with two hollow side-walls, which contain the controlling machinery, and afford a support for shores to the vessel. The ends are left open, the under-deck displacement being greater than the combined weight of ship and dock, and so affording sufficient buoyancy to lift the deck above water-level. Both pontoon and sides are cut up by numerous water-tight bulkheads into compartments to ensure stability in case of listing or with an uneven load.

Floating docks require periodical inspection throughout because of the destructive action of the sea water. Modern large floating docks are so designed that each part may be exposed for inspection in turn; this latter end is achieved by building the dock in sections, so that it is what is called self-docking. The largest floating docks are of steel, but most of the smaller docks today, that is those under 20,000 tons capacity, of which a great

number were built in the United States during the war, are either entirely of timber or have timber pontoons with steel frame side-walls. One or two docks have been built of reinforced concrete.

Dock Warrant, a document issued by a dock company or dock owner stating that certain goods therein mentioned have been received and are deliverable to the owner or his assignees.

Doctor, a title originally the equivalent of 'teacher,' later developed into an honorary title and academic degree. It was first used as an academic degree in the law schools of Italy in the 12th century, and at first was not distinguished from 'master' and 'professor.' For a long time conferred only by faculties of law, it was gradually extended to theology, medicine and philosophy, and today constitutes the highest academic honor in the various fields of research. The degrees ordinarily granted as a mark of distinction are: LL.D., doctor of laws; D.C.L., doctor of civil or canon law; J.U.D., juris utriusque doctor; D.D., doctor of divinity; S.T.D., doctor of sacred theology; LITT.D., doctor of letters; D.H.L., doctor of humane letters; D.M. or MUS.D., doctor of music. By common consent in Germany, England, and America the degrees of PH.D., doctor of philosophy, and M.D., doctor of medicine, are granted today only after examination and the completion of prescribed work. The extension of university courses has led also to the establishment of the doctor's degree in other departments, as D.SC., doctor of science; D.D.S., doctor of dental surgery, etc.

Doctrinaire, an unpractical theorist who argues on a 'theoretic scheme of policy that admits of no pliability for contingencies' (Lowell). The term is usually applied to social or political ideologists. The French doctrinaires who flourished during the restoration period advocated a constitutional monarchy on the English model.

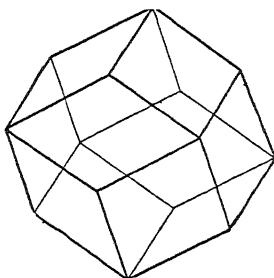
Dodder (*Cuscuta*), a widely distributed genus of parasitic plants, usually regarded as degenerate convolvulaceæ.

Doddridge, Philip (1702-51), English nonconformist divine, was born in London, and became pastor of the dissenting congregation at Kibworth (1723). His works include *On the Rise and Progress of Religion in the Soul* (1745). He was also the author of numerous hymns, including 'Awake, my soul, stretch every nerve.'

Dodecagon, a regular polygon of twelve equal sides and angles.

Dodecahedron, in geometry, a regular solid with twelve faces.

Dodecanese Islands, a name derived from the Greek words *dodeca* and *nesos*, meaning twelve islands, and applied to the group of islands in the Ægean Sea, lying off the s.w. coast of Asia Minor. It consists of the Islands of Stampolia, Searpanto, Caso, Piscopi, Nisiro, Colimno, Lero, Patino, ancient Patmos, Cos, Simi, Calchi, Lepso and a num-



Dodecahedron.

ber of small uninhabited islets. At the close of World War I they were allotted to Italy by the treaty with Turkey. They were seized by the Germans in 1943, and restored to the Greeks in Oct., 1944.

Dodecatheon, a genus of hardy plants belonging to the order Primulaceæ. They are popularly known as American Cowslips or Shooting Stars.

Dodge, Charles Richards (1847; dec.), American textile fiber expert. In 1870 he began his study of fibres and in 1890 was made special agent of the Department of Agriculture to investigate fibres and the fibre industries. He published many reports and a valuable *Dictionary of the Fibre Plants of the World*. He was decorated by the French government and was a member of many scientific societies.

Dodge, Grace Hoadley (1856-1914), American social worker, was born in New York. She was, besides a prolific writer and editor, a member of the New York City School Board, Treasurer of Teachers College, Columbia University, president of the Working Girls Society, president of the National Board of the Y. W. C. A. and a member of the world's committee.

Dodge, Grenville Mellen (1831-1916), American soldier and civil engineer. Resigning from the army in 1866, he took charge of the construction of the Union Pacific Railroad. Later he built the Texas and Pacific Railroad and became interested in railroad

construction in France, Germany, Canada, and Mexico.

Dodge, Mary Abigail (1833-96), American author. She was born in Hamilton, Mass., from which town she took the pseudonym 'Gail Hamilton.' She was a cousin of Mrs. James G. Blaine, whom she assisted in social matters during the latter's Washington life. She began literary work with *Country Living and Thinking* (1862), and published books at more or less frequent intervals until her death. She also wrote much for children, and was a member of the staff of *Our Young Folks* from 1865 to 1867.

Dodge, Mary Elizabeth Mapes (1838-1905), American author. Her *Irrington Stories* (1864) for children met with success, and was followed by *Hans Brinker, or the Silver Skates* (1865), which became a juvenile classic. On the establishment of *St. Nicholas* Mrs. Dodge became its editor; this position she retained until her death.

Dodge, William Earl (1804-83), American merchant. He was elected to Congress as a Republican in 1866, was president of the N. Y. Chamber of Commerce for several terms.

Dodge City, tn., Kan., co. seat of Ford co., is a shipping point and distributing center for an agricultural and stock-raising region; p. 8487.

Dodgson, Charles Lutwidge. See **Carroll, Lewis**.

Dodo (*Didus ineptus*), an extinct flightless pigeon, which lived in Mauritius until 1681, if not later. It was larger than a turkey, had a huge bill, short legs, and is stated to have laid a single large egg on a mass of grass.

Dodona, one of the most ancient religious centers in Greece, famous for its oracle of Zeus. The priests were called Selli; they interpreted the will of the god in answer to questions of the oracle, which was signified by the rustling of the wind through the leaves of oak or beech trees.

Dodsley, Robert (1703-64), English bookseller and author. With the proceeds of his works and the assistance of Pope he set up as bookseller in Pall Mall, becoming one of the most enterprising London publishers of the day, and putting out works for Pope, Johnson, and Goldsmith.

Dog, a term which is used in a general sense to designate the animals known as wolves, foxes, jackals, wild dogs, and in a more restricted sense for the varieties of the domesticated dog and the Australian dingo. In the first meaning it is applied to the members of

the family Canidæ. The shape of the domestic dog's skull presents more divergencies than that of any other animal. The dog is gifted with the acutest sense of smell, hearing, and sight. The coat of the dog varies from almost hairless hide to shaggy fur. The dog is carnivorous by nature, but can subsist on vegetable food in both the wild and domesticated states. In some cold countries it lives on fish, in many tropical ones on the foulest offal. On the other hand, certain well-bred varieties of sporting dogs will refuse to eat game and fowl. The average age of a dog is from twelve to fourteen years.

Types of dogs, similar in general outline to those of the present day, existed in Egypt from four to five thousand years ago, as sculptured delineations prove. Early Britain was famous for its dogs. Dame Juliana Berners, writing early in the 15th century, gives a list of domestic dogs as follows: 'A Greyhound, a Bastard, a Mengrel, a Mastif, a Lemor, a Spynel, Raches, Kenettys, Teroures, Butchers' Hounds, Dunghylle Dogges, Tryndeltaylles, Pryckeryd Currys, and small Laddyes' Poppees.' The bull-dog was originally called the butcher's hound because it was employed to catch and detain cattle, seizing them by the nose or lip until they could be dealt with. The last quarter of the 19th century witnessed a great development in the size, shape, style, color, appearance, and what are generally called the 'points' of dogs. The species seems to lend itself to the art of the breeder; in fact dog-breeding has become a business, fostered and controlled by clubs devoted to the breeding, registry, and competitive exhibitions of highly bred dogs in general, or to some particular kind. A dog is 'valued' by its 'points' or features of stated value according to standards of form. But fashion and the fancy of breeders changes opinion concerning 'points' constantly.

Growing whelps, especially in the larger varieties, require food from four to six times a day, whilst adult animals thrive best with one, or at most two meals in the twenty-four hours. For hunting, coursing, shooting, and retrieving, game dogs are the chief instrument of man. The shepherd would be helpless without them. In snowy northern latitudes, such as Siberia, Greenland, and Alaska, the dog is often the only draught-animal. As turnspit it has performed useful domestic duties. A less savory employment for the dog is that of scavenger—a task it performs in many Eastern and most Mohammedan cities. The blind man finds in the dog a patient and intelligent

guide. The fame of the St. Bernard is proverbial; the Newfoundland dog enjoys a like fine reputation for saving people from drowning. The latest development of their instinct is their training as 'war dogs' for scouting, and also for ambulance services on the field of battle. There are about 200 varieties of dogs differentiated by naturalists, but in many cases the difference is more of habitat than of actual species. The most important diseases of dogs are distemper and rabies.

Canine distemper, in its common form, is an infectious catarrh of the mucous membranes of the eyes and respiratory and digestive organs. The nervous system and the skin may be attacked. Complications are numerous. The disease is rare in dogs over two years old. A study of distemper has recently shown that dogs may be inoculated. Attempts are being made to discover how effective are the various methods and vaccines. As with colds, prevention by isolation and correct feeding is important.

Rabies (hydrophobia) is a contagious disease of dogs transmissible by inoculation to man, carnivora, and other animals. It is always transmitted by the bite of a rabid animal. There are two forms of canine rabies—furious and dumb. In the furious form there are three stages. The dog is restless and excited, or sullen and morose. These symptoms last one or two days. In the next stage, characterized by attacks of maniacal fury lasting some hours, the dog tries to escape from home and wander into the country. A mad dog will travel great distances, and will attack and bite savagely any animal which comes in its way. Death generally occurs between five and eight days after the appearance of the first symptoms. In the dumb form of rabies the lower jaw is paralyzed early and hangs down; the dog cannot bite, and death occurs in two or three days from paralysis. The treatment of rabid dogs is not permitted or desirable. The prevention of the disease consists in strict quarantine regulations imposed on all imported dogs for six months; while destruction of the affected animal and compulsory muzzling of all dogs within a radius of 30 miles for three months or more will stamp out rabies. Pasteur's inoculation treatment with attenuated virus for the prevention of rabies in persons bitten by mad dogs, is the treatment which is prescribed.

Mange or scabies of the dog is a contagious parasitic skin affection; the dog scratches the part persistently, and scabs form on the skin.

The hair of the affected parts becomes broken and falls off. Eczema in the dog is known as red mange, blotch, and surfeit. It is a non-contagious inflammation of the skin caused by over-feeding and various disorders of the digestive organs. Internal parasites are very numerous in dogs. See J. Woodroffe Hill's *Management and Diseases of the Dog* (1900).

Dog Days, the hottest period of the year, associated by the ancients with the influence of Sirius. The Greeks assigned fifty days to the baleful reign of the dog-star, supposed to begin with its heliacal rising on July 19, but continually retarded by the effects of precession.

Doge was the title of the chief magistrate in the city republics of Genoa and Venice. The first Genoese doge was elected in 1339. In Venice the first doge or duke was elected in 697. The dignity was abolished in both states in 1797.

Dog-fish, a general name for the sharks of the family Scyllidæ, characterized by the fact that the first dorsal fin is placed either above the insertion of the pelvic fins or behind these.

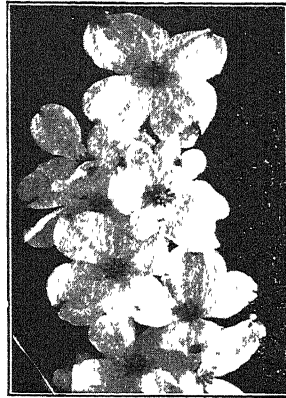
Dogger, a two-masted fishing-vessel with bluff bows, so called from its use on the Dogger Bank in the North Sea.

Dogger Bank, sand bank occupying the middle of the North Sea, almost midway between England and Denmark, and extending to within 40 m. of the coast of Yorkshire. It is a famous and busy cod-fishing center. See Mather's *Nor'ard of the Dogger* (1887). Here, on the night of Oct. 21, 1904, a Russian fleet, when on its way to the Far East, fired upon the Hull fishing fleet, sinking the *Crane*, damaging other trawlers, killing two of the fishermen, and seriously wounding a number of others. After firm representations had been made to the Russian government, a convention appointing an International Commission to inquire into the incident was agreed to. The Russian government paid compensation to the families of the dead and injured men, and to the owners of the trawlers concerned.

Dog License. Most cities and towns of the United States impose annual taxes upon all dogs kept within town limits. This tax is in the form of a dog license and any unlicensed dog may be destroyed by the public authorities.

Dogma means a 'decree' in classical and Biblical Greek, and came eventually to be used for a philosophical tenet from which the application to a theological doctrine is but a step. It has been in common usage in connection with Christian teaching since the 4th

century. This development of its meaning illustrates the process by which a personal judgment becomes, by acquiescence of many, an authoritative statement supposed to have objective validity. The Greek and Roman Catholic Churches regard their systems of belief as fixed; while the Protestant churches, though inheriting a considerable part of the old dogmas, really view the Christian teaching from a standpoint incompatible with that of the older communions—regard it no longer as dogma at all. See Harnack's *History of Dogma* (1894-9) and *Outlines* (1893). Loof's *Manual* (1893) gives the literature very fully.



Dogwood Blossoms.

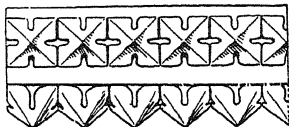
Dogmatic Theology, or Dogmatics (Ger. *Dogmatik*), is the science which investigates, defines, and systematizes the doctrines of the Christian Church. The first attempts at systematic statement were made by Origen and Augustine. The Middle Ages produced the great works of Anselm, Thomas Aquinas, and Duns Scotus. The Reformation brought Melancthon's and Calvin's works. The 19th century had great names, and America during the last ten years has produced outstanding new interpretations, notably from scholars at Yale, Union, and Chicago Theological Seminaries.

Dog's Bane, a name given to various species of the genus *Apocynum*, the best known of which is *A. androsaemifolium*, a hardy perennial herb, with ovate, opposite leaves, and cymes of bell-shaped, pink-striped flowers in summer.

Dog's-tooth Violet (*Erythronium*), a genus of liliaceous plants mostly about six inches in height, are, with one exception, na-

cives of N. America. The best known is the pretty, yellow-flowered *E. Americanum*, or adder's tongue, with its purple-blotched leaves, which blooms in April and May.

Dog-tooth Ornament, a moulding used in Early English architecture, composed of a hollow in which is pendent a series of pointed tabs resembling teeth. It appeared first in Europe in 1090.



Dog-tooth Ornament (Early English).

Dog-watch. At sea the hours between 4 p.m. and 6 p.m., and between 6 p.m. and 8 p.m., are respectively the first and second dog-watch. See WATCH.

Dogwood, a name given to a genus (Cornus) of hardy deciduous shrubs and trees belonging to the order Cornaceæ. The best known species is the flowering dogwood (*C. florida*). When cultivated in the open, this resembles a young apple-tree, but it generally grows at the margin of woodlands. The branches have a horizontal, shelving habit, and are laden, in May, with masses of flower heads subtended by four large, broad, emarginate bracts, snowy white or tinged with rose.

Doheny, Edward Laurence (1856-1935), American oil magnate. For twenty years he prospected in California for oil and gold before making his first "strike" in 1892. Subsequently he acquired millions of acres of oil land in Mexico and formed the Mexican Petroleum Company. As a result of disclosures in the Teapot Dome investigation, he was charged with having bribed Albert S. Fall (q.v.) for a lease on the Elk Hills Naval oil reserve, but was acquitted in two trials.

Doherty, Henry Latham (1870-1939), operator gas and electric companies, was born at Columbus, O. Starting as an office boy at the age of 12, he was successively promoted until 1890. 1890-1905, he was engineer and manager of public utility companies in many different cities. He organized the Henry L. Doherty Co., bankers and operators of public utility corporations, in 1905, and subsequently served as its manager. In 1910 he organized the Cities Service Co. and served as president from 1910 up to his death. He was awarded various medals, was recognized as

one of the leaders in America in his industry.

Dohnanyi, Ernst von (1877-), Hungarian pianist and composer of operas, has made several concert tours of the United States, conducting in 1925 the New York State Symphony Orchestra.

Dolbear, Amos Emerson (1837-1910), American inventor, born in Norwich, Conn., graduated at Ohio Wesleyan in 1866. Two years before his graduation he invented the writing telegraph. In 1874 he became professor of physics at Tufts College, and after that date inventions followed rapidly, such as the magneto telephone, static telephone, spring balance ammeter, air space telegraph cable, the convertibility of sound into electricity, telegraphing without wires, and photographing with electric waves.

Dolci, Carlo (1616-86), Italian painter, born in Florence, was a notable example of the religious mannerists of the 17th century. His devotional pictures are tranquil and sentimental. His *Virgin and Child* is in the National Gallery, London.

Doldrums, a belt of calms between the northeast and southeast trade-winds. Vessels have been sometimes becalmed in these regions for weeks at a time, under a cloudless and torrid sky, the oppressive calm being broken occasionally by violent squalls, torrential rain, and severe thunderstorms. The average position of the middle of the calm belt is in 5° n. lat.; but it changes slightly with the sun's declination, being at 10° n. in August and at 1° in February.

Dole, a term used to describe unemployment relief, chiefly applied to the method used in England, especially in recent years. In the United States efforts to have been made to avoid this particular name and form of relief.

Dole, Sanford Ballard (1844-1926), Hawaiian statesman, born in Honolulu, of Am. parents. He graduated at Williams College, Mass., and was made a member of the Hawaiian Supreme Court (1887-93). After the revolution against the monarchy in 1893, of which he was the leader, he was made president of the provisional government and subsequently elected president of the republic. After the annexation of the islands to the U. S. in 1898, he was appointed governor in 1900-03, and afterward United States district judge.

Dolgorukoff, Prince Paul Dimitrievich (1865-1927), Russian patriot, active member of the Cadet party, pacifist. After the Revolution he was imprisoned by the Bolsheviks, escaped to Crimea where he was active in the

White movement, returned in disguise to Russia and was put to death.

Dolichocephalic. See **Anthropology**.

Dolichos, a genus of twining, leguminous plants, mostly natives of tropical countries, where many of the species yield edible seeds and pods for which they are cultivated, while in America others are grown for their flowers. The soy bean, *Dolichos soya*, or *Soja hispida*, enters into the Chinese condiment 'soy'.

Doll, this plaything, used especially by girls, dates from the earliest times and is found in all tribes and nations. It is interesting in connection with primitive worship. The Hurons worshipped carved wooden figures; so also the Virginia Indians. The Kurile Islander throws his doll into the sea to allay the storm; the Polynesians believe absolutely that spirits dwell in the dolls and the Society Islanders place wooden images in burial-places to receive the souls of the departed. In Buddhist Tibet, as also in Siam, we find the practice of conjuring demons into puppets. The Turanians in N. Asia clothe rough-looking objects with costly garments and worship them with awe and reverence. The manufacture of dolls has been a peasant industry in Europe for centuries. Factory output began in the 19th century and has developed from the French and German kid-bodied or cloth-bodied dolls through the period of the wax doll to the modern 'composition' dolls of infinite variety and charm. Many museums specialize in 'period' dolls to illustrate native or historic costumes. See **Tov**.

Dollar, originally derived from the word *thaler*, short for *Joachimsthaler*, because first coined, near the end of the 15th century, from silver taken from the valley of Joachim in Bohemia. It was also applied to similar coins of Scandinavia and the Low Countries, but particularly to the silver peso of Spain, also known as the *pillar dollar* (having on it the Pillars of Hercules). The dollar is now the monetary unit of the British possessions, Honduras, Colombia, Liberia, Hong-kong, and the United States. The silver peso of Mexico (containing 377.1482 grains pure silver) is commonly known in commerce as the Mexican dollar.

In the first coinage act of the United States (April 2, 1792), the dollar appeared in the ten-dollar gold piece (of 247.5 grains pure gold), and in a silver dollar (of 371.25 grains pure silver), on a bimetallic ratio of 15:1. The ratio has been changed by later acts. The one-dollar gold piece was not coined until March 3, 1849; but its smallness caused in-

convenience, and it was forbidden by law (Sept. 26, 1890). The term dollar is also applied to all paper equivalents issued by the government. When the United States left the gold standard in 1933, certificates promising payment in gold were recalled. See **COINAGE**; **BIMETALLISM**.

Dollfuss, Engelbert (1892-1934). Chancellor of Austria 1932-34, was assassinated at Vienna in July 1934 during the National Socialist "putsch." His small stature—he was only four feet eleven inches tall—was responsible for his designation as "the little iron Chancellor."

Dolliver, Jonathan Prentiss (1858-1910), American lawyer and legislator. He was elected in 1888 a Republican member of Congress from Iowa, and served six terms in succession. He was appointed to the U. S. Senate to fill a vacancy in 1900, and was elected to it in 1901 and 1907. He was a prominent advocate of railroad-rate legislation in 1905-6. In 1905 he introduced a bill which greatly increased the powers of the Interstate Commerce Commission.

Dolly Varden Trout, the common brook trout of the Rocky Mountain region (*Salvelinus malma*), so called from its gayly variegated coloration. It occurs in small, rapid streams from Wyoming to Kamchatka. Other names are 'bull trout' and 'red-spotted trout.' It has been extensively introduced into Eastern waters. See **TROUT**.

Dolmen is a term used to designate a prehistoric structure, probably always sepulchral, consisting of a large, flatish stone supported by two or more stones. The dolmen area in Europe is very extensive, fine examples being recorded in Denmark and Sweden, the north of Germany, in the Mediterranean islands, and in Spain. France, however, is the archæological home of the dolmen, some of the most remarkable being there. In the British Isles, Cornwall and Wales possess many specimens, while Ireland contains the great number of seven hundred and eighty. The dolmens may be referred to the later stone age and the bronze age. See **CROMLECH**.

Dolomite is a well-known mineral, consisting of the carbonates of calcium and magnesium, and very similar to calcite, though its crystalline form is not exactly the same, and it has a slightly higher specific gravity.

Dolomites, The, includes the Alps of Southern Tyrol, between the Brenner line (w.) and the Piave and Sexten valleys (e.), though there are dolomites in the French and Swiss Alps also. It is mainly a magnesian

limestone district, in which the peaks assume the most fantastic forms. It is much frequented by travellers every summer.

Dolon-Nor, or **Lama-Miao**, town, Mongolia, 165 m. n. of Peking. It is one of the chief trade centers of East Mongolia, contains many Buddhist temples and extensive ruins, and is noted for the founding of iron and brass idols, bells, vases; p. 30,000.

Dolphin (*Delphinus*). The common and traditional European dolphin, symbol of Neptune, is *D. delphis*, one of the smaller members of the whale tribe, about seven and a half feet in length, dark gray above and whitish beneath. It is numerous in the Mediterranean, where it occurs in shoals or schools. The body is slender and the head small, the beak long and narrow, the back fin and flippers sickle-shaped and elongated. The name is also applied to species of *Coryphæna*, which are remarkable for beautiful tints and good flesh.

Dom, the loftiest peak (14,942 ft.) of the magnificent Alpine group of the Mischabelhörner, which rises between the valleys of Zermatt and Saas.

Dome, a round or polygonal, convex roof. This form was used very early by the Assyrians and Persians as well as by the Pelagic tribes, but the Romans were the first to make it a massive and important architectural feature. In the Roman type, the dome rested solidly on a circular base, as in the Pantheon. The Byzantine type of the 6th century was first used in the Church of St. Sophia, Constantinople. In this type, curved triangular surfaces, called pendentives, effect a transition between the dome and its supporting piers, making possible a base of any shape. The domes of the *Mosque of Omar* in Jerusalem, the *Mosque of Kaït Bey* in Cairo, and the *Taj Mahal* in India (see INDIA) are copied partly from Byzantine models. In Europe, also, these models were extensively imitated, and the use of the same became general. The three most famous domes in Europe are those of St. Sophia, the Pantheon, Rome, and St. Peter's, Rome. In Paris, the domes of the Invalides and the Pantheon are well known; while the finest examples of domes in Great Britain are St. Paul's Cathedral and the Albert Hall, both in London. In the United States the dome is a prominent feature of various public and educational buildings. The domes of the Capitol at Washington (96 ft. in diameter) and the Cathedral of St. John the Divine, New York City, are notable examples. The latter is the largest dome in

America (135 ft. in diameter), and the first in the world to be built without staging or framework.

Domenichino, **Domenico Zampieri** (1581-1641), Italian painter of the Bolognese Eclectic school. In 1620, invited by Gregory xv., he settled in Rome as painter and architect to the Apostolic Chamber. He was a careful and learned artist, though lacking in invention, his coloring rich, his draughtsmanship accurate. His chief composition, *The Communion of St. Jerome* (Vatican), was hung in St. Peter's as a companion picture to Raphael's *Transfiguration*. His finest works are frescoes in the cathedral at Fano, and at Grottaferrata near Rome, and his *Diana* (Rome, Borghese Gallery).

Domesday Book, or **Doomsday Book**, the record of a statistical survey of England made by William the Conqueror in 1085-7. It contains information regarding ownership, state of cultivation, area of cultivation, population, in its various classes of vassals—freemen, villeins, cottars, and serfs; and all with a view to ascertain the value of the land and its taxable capacity. It was printed in two volumes in 1783-93 and 1816.

Domestication of Animals. The two most obvious criteria of a domesticated animal are—(1) that the forms in question must be fertile in captivity or in the artificial conditions which meet human requirements; and (2) that they must be hereditarily docile or educable, which excludes individually tamed animals. Domestication implies humanly controlled selective breeding, and a humanly controlled more or less artificial environment. Not only is the actual process of ancient domestication unknown to us, but the origin of some of the domesticated races is very obscure. There is no consensus of opinion as to the probable history of the different races of cattle now found in Europe or even in Britain, and the same uncertainty extends to horses. In contrast to such cases, it seems certain that *Gallus bankivus*, still found in India and the Malay Islands, is the wild stock from which since 1400 B.C. so many different breeds of domestic fowl have been derived. It is usually supposed that several distinct wild species of jackal and two or more species of wolf have given rise to domesticated dogs; and the evidence is strong that all the pouters, carriers, fantails, tumblers, barbs, etc., are descended from the one wild species, the common European rock-pigeon (*Columba livia*). See BREEDING, HEREDITY, and VARIATION.

Domestic Servants are servants usually

occupied in work in or about a household. The legal status of domestic servants is more clearly defined in England than in this country. There are, however, in many states, statutes regulating the agencies for the employment of servants. See also EMPLOYERS' LIABILITY.

Domett, Alfred (1811-87), British colonial statesman and poet. His most intimate friend was Robert Browning, whose poem *Waring* is written about him.

Domicile. In law, a person's domicile is the place or country where his permanent home is, and to which he always has the intention to return when absent from it. It is not necessarily the same as his place of residence, for a person may be living in a foreign country temporarily. In such a case, although not residing in his own country, he is still domiciled there. But if the acts of a person reasonably indicate that he intends to make his home for an indefinite period in a foreign country, the fact that he declares from time to time his intention of ultimately returning to his own country will not be conclusive evidence that he has not changed his domicile. A person's domicile may be that which he acquires by origin, or birth, by choice, or by operation of law. Domicile of choice is when a person settles in a country with the intention of remaining there permanently, and of abandoning his original domicile. Domicile acquired by operation of law is exemplified in the case of a married woman, whose domicile during the existence of her marriage is the same as that of her husband. A man is entitled to vote at the place of his domicile. It is important to ascertain where one is domiciled, because many legal questions must be settled by the law of the domicile, as, for instance, the probate of a will of personal property depends upon the domicile of the testator at his death.

Dominant is the name given to the fifth note of a diatonic scale. See SCALE.

Dominic, Saint (1170-1221), founder of the Dominican order. His name was Dominic de Guzman, and he was born at Calaroga in Old Castile. Ascetic in habits, earnest and eloquent as a preacher, and of fiery zeal, he founded an order of preaching friars for the conversion of heretics, but to disarm opposition he adopted the rule of St. Augustine. Pope Innocent III. formally approved the order in 1215. The Dominicans adopted a vow of poverty in 1220, which was at first so rigidly observed that they became mendicant or begging friars. The friars were called in Eng-

land the Black Friars, from their dress; and in France, 'Jacobins,' from the name of their house, St. Jacques. The influence of the order practically vanished before the growing power of the Jesuits, but revived later, and there are now about 50 provinces, under a general who resides in Rome. There are many Dominican nuns in the United States, the first convent having been established in Kentucky in 1822, but few male members of the order. Dominic died at Bologna, and was canonized by Gregory IX. thirteen years later (July 3, 1234).

Dominica, British isl., Leeward group, W. Indies, between the French islands of Guadeloupe and Martinique. It is mountainous and volcanic. It was discovered on a Sunday (Dominica) and named by Columbus in 1493. The exports are cattle, cocoa, lime-juice, rum, molasses, and sugar. The capital is Roseau. Area, 291 sq. m.; p. 41,671.

Dominican Republic. See **Santo Domingo**.

Dominion Status. Within the territories subject to the British Empire there is every variety of government. The dominions are self-governing with practically complete autonomy, or political independence. Since the imperial conference of 1926, the several governments of the dominions have stood on an equal basis with the British government itself, and the ministers of the dominions advise the Crown on their affairs. In the League of Nations, this status results in each dominion taking its place on an equal footing with the representatives of Great Britain and other countries.

Domino, a hood worn by canons of a cathedral church and also by priests for protection when officiating in winter. The term is also applied to a disguise dress or a silk cloak with wide sleeves and a hood worn at a masquerade, and also denotes the half-mask worn on the face to conceal the features.

Dominoes. Some maintain that this game has come from the Chinese; others, from the Egyptians; others, from the Jews; but there is no trustworthy evidence of its existence before the 18th century. At the beginning of that period it seems to have been introduced from Italy into France, and thence into Germany and the Low Countries.

The game is played with flat oblong pieces of bone, ivory, wood, or even cardboard. The face of each is a double square, each being either blank or marked with a certain number of black spots. The game is generally played with 28 pieces.

The commonest form of dominoes, called the 'block game,' is played by two persons. The pieces are placed on the table face downward, and moved about so as to effect a shuffle. To determine who moves first, each takes up a piece, and the player who has the smaller number of spots leads. The two pieces are returned to the pile, and again shuffled. Each player then draws seven pieces, which he looks at, while keeping the spots hidden from the adversary. The first player places a piece, usually one with the largest number of spots on it, face upward on the table. By way of illustration, say, A leads with 6-5. B must play a piece with either a 6 or a 5 on it, and must place it so that the corresponding squares adjoin; he plays 6-3. A now must place either a 5 or a 3 against the corresponding square; and so on until neither is able to play, when the game ends. The pieces left are now turned over, the spots counted, and he who has the smaller number is the winner.

The 'draw game' is played with this difference, that when a player is unable to play, he draws other pieces from the 14 pieces reserved with their faces down on the table, until he finds one with which he can play. The game then proceeds as in the block game. See Hoffman's *The Book of Card and Table Games*.

Domitian, emperor of Rome 81-96 A.D., whose full name was TITUS FLAVIUS DOMITIANUS AUGUSTUS, younger son of Vespasian, was born at Rome 52 A.D. After the death of his brother Titus, which he is believed to have caused or at any rate hastened, he was made emperor by the soldiers in 81 A.D. His government was marked by the enactment of valuable laws, a strict supervision of the provinces, and a rigid administration of justice. The later years of his life were a reign of terror, until he was murdered by some of his officers. Tacitus and Juvenal give a very dark picture of the vices of his reign.

Domremy-la-Pucelle, vil., dep. Vosges, France. Here, in 1412, Joan of Arc was born; hence her designation, *La Pucelle* (see Shakespeare's *First Part of King Henry VI.*, v. 4). The house in which she dwelt is now one of the historic monuments of France, and was purchased by the state in 1818. A magnificent statue of the heroine was erected here in 1890; p. 308.

Don. (1.) River of S. Russia, issuing from Lake İvanski or Ivanov, in Tula government. It crosses the governments of Ryazan, Tambov, Orel, Voronezh. and the territory of the Don Cossacks, its length being about

1,200 miles. It is a very winding river, difficult to navigate. A canal, 90 m. long, connects it with the Volga. The Don is the Tanais of the ancients, and in the Græco-Roman geography marked the boundary between Europe and Asia. Fishing is an important industry in its lower course. (2.) River, York, England; rises in the Pennines, flows through Sheffield and Doncaster, and joins the Ouse at Goole. (3.) Salmon river, Aberdeenshire, Scotland, rising on the borders of Banff, and following a winding course of 82 m., enters the North Sea.

Donatello, or **Donato di Nicolo di Betto Bardi** (1386-1466), Italian sculptor, born in Florence. Cosimo de' Medici became his steadfast benefactor. Learning the goldsmith's art and bronze work from the father of Lorenzo Ghiberti, he helped in casting the great baptistery doors in Florence. When 17 he went to Rome with Brunelleschi, and studied the Roman and Greek antiquities. In 1449 he made his fine crucifix, and in 1451 the Gattamelata statue—the first equestrian statue since the Roman period. Much of his finest work was executed in Florence; his celebrated reliefs, such as those for the singing gallery of the cathedral (1433); his masterpiece, *St. George*, for San Michele (1416); the bronze *David* in the Bargello. His genius, while essentially Greek in character, was Christian in expression. See J. A. Symonds' *Renaissance in Italy* (1875-86); Trombetta's *Donatello* (1887); and Vasari's *Lives of the Painters*.

Donati, Giambattista (1826-73), Italian astronomer, born at Pisa, and began his career in the Florence observatory by making a study of the spectra of the stars. His greatest feat was the discovery of 'Donati's comet' in 1858. In 1864 he became principal astronomer in Florence observatory, and published careful observations on the luminous phenomena of the great Polar aurora of 1872.

Don Cossacks Territory, prov. of S. Russia, bounded by the Sea of Azov and the lieutenantancy of the Caucasus on the s. and s.e. The province belongs almost entirely to the Steppe region, but rises in places to about 1,000 ft. The plain is dotted with artificial mounds, the so-called tombs of the Huns or the Scythians. Among the chief natural products are coal, iron, salt, and gypsum. Among the factories are soap and candle works, tanneries, distilleries, breweries, iron and copper foundries, potteries, brick-making works, tobacco manufactories, etc. Fishing is an important industry. In 1918 the territory was made a republic. It was later captured by

the White Russians, but retaken by the Red army in 1920, and is now the Cossack Autonomous Socialist Soviet Republic. The capital is Novocherkassk.

Donegal, co. in prov. Ulster, n.w. of Ireland. The coast is indented by numerous arms of the sea. The surface, for the most part, is mountainous, with considerable tracts of bog. There is some magnificent coast scenery, also inland lake scenery; and St. Patrick's Purgatory, on an island in Lough Derg, is still a place of pilgrimage. Agriculture is limited; many of the coast folk are engaged in the fisheries and in kelp-making; the linen and tweed manufactures, lace-making, and other domestic industries are advancing. Area, 1,860 sq. m.; p. 168,420.

Donelson, Fort, and **Henry, Fort**, the two most important forts in the first Confederate line of defence in the West, captured by the Federals in 1862. The fall of the two forts forced the Confederates to abandon their first line and form another along the Memphis and Charleston Railroad, and had an important bearing on the campaign in the West; among other things it greatly increased Gen. Grant's reputation and had much to do with bringing him prominently before the country as an able and aggressive Federal leader. See Swinton, *Decisive Battles of the War* (1867); and Grant, *Personal Memoirs* (1895).

Dongan, Thomas (1634-1715), American colonial governor, born in Co. Kildare, Ireland. He was appointed governor of the province of New York (1682), where his adherence to Roman Catholicism made him unwelcome. He disarmed suspicions by his sincere devotion to colonial interests, by giving both to New York and to Albany charters that were the origin of municipal independence, and by his shrewd conciliatory management of English, French and Indian relations. He returned to England in 1691, and became Earl of Limerick in 1698.

Dongola, prov. of the Sudan, in the valley of the Nile. It remained Egyptian from 1820 until the Mahdi insurrection (1885), but was reconquered in 1896 by Anglo-Egyptian forces under General Kitchener; p. about 56,000, mostly of Nubian race.

Don Juan (Tenorio). The original story, believed to be founded on fact, is as follows. The son of an illustrious family in Seville, Don Juan Tenorio eloped with the daughter of the Comendador Ulloa, whom he afterward killed for reproaching him. The excesses of Don Juan continuing to be a scandal to

the city, and ordinary justice being unable to reach him, he was enticed by the Franciscan friars into their monastery, and there murdered. The popular legend was first dramatized by Tirso de Molina (*El Burlador de Sevilla*), and Zamora, Molière, Byron, Dumas, and others have utilized the same theme. Mozart's opera on the same subject is only one out of several.

Donkey-Engine, a small subsidiary engine driven by steam from the main boilers, and employed on board ship for working windlasses, capstans, and pumps.

Donne, John (1573-1631), English poet and divine. His *Pseudo-Martyr*, written as a contribution to anti-Catholic controversy (1610), brought him into notice as a theologian. In 1615 he took orders, was made chaplain to the king, and proved a subtle and powerful preacher. He was made dean of St. Paul's (1621). See *Life* by Izaak Walton (1640); *Life and Letters* by E. Gosse (1899).

Donnelly, Ignatius (1831-1901), American author, was U. S. Congressman from Minnesota, in 1863-9. He will be remembered for *The Great Cryptogram* (1887), in which he presented a theory of the Baconian authorship of Shakespeare's plays based on a cipher supposed to have been discovered by himself in the First Folio.

Donoghue, John (1853-1903), American sculptor, was born in Chicago, Ill., of Irish parentage, and began his studies at the old Academy of Design in that city. His spirited sculpture, *Young Sophocles Leading the Chorus after the Battle of Salamis* (1885), now in the Chicago Art Institute, is considered one of the masterpieces of American sculpture.

Don Quixote. See **Cervantes**.

Dooley, Mr. See **Dunne**.

Dooling, James J. (1893-), Leader of Tammany Hall, New York, 1934-1937. Served in World War I, returning to complete his law education. The only political office he ever held was that of deputy public administrator from 1923 to 1932.

Doolittle, James H. (1896-), Major General of the U. S. Army Air Force; conducted, April 18, 1942, the sensational air raid on Tokyo, Nogoya and other Japanese cities, and commanded U. S. air forces in N. African and Normandy invasions.

Doomsday Book. See **Domesday Book**.

Doon, loch and riv. in Ayrshire, Scotland. The River Doon, immortalized by Burns, runs through the loch into the Firth of Clyde.

Doones, The, a maurauding tribe formerly

living at Badgworthy, Exmoor, Devonshire. They figure prominently in Blackmore's *Lorna Doone* (1893).

Door. In W. Asia the doorway was anciently regarded as one of the most important features of a structure, and was magnificently enriched and decorated. With the triumph of Roman art doorways again became important. The width of the openings, limited hitherto by the length of the lintel obtainable, now became a matter of choice. They were spacious, sometimes squareheaded, but more often arched. In Gothic art, doors formed of upright planks, feather-tongued and grooved and secured by band-hinges, were usually ornamented with scroll work. The w. front, Notre Dame, Paris (1214), is a striking example of the French Gothic of the 13th century. The doorway of the cathedral at Siena is an exceedingly good specimen of the beautiful and peculiar Gothic style. Many examples of Norman doors are elaborately moulded and carved, the setting deeply recessed and ornamented.

Doppler's Principle, announced by Christian Doppler at Prague in 1842, is, that motion changes the refrangibility of light. The ethereal waves of which light consists are shortened if the emitting source is approaching the eye, lengthened if it is in course of recession from it. And the movements of the spectator produce indistinguishable effects. 'Fraunhofer lines' were used as standards of reference for determining motion-displacements by Fizeau in 1848. This form of research is one of the most fruitful in modern astronomy. Doppler's principle has also been turned to account for determinations of the rotational speed of the sun and some of the planets, and for the verification of the meteoric constitution of Saturn's rings.

Dorado, the **Gold-Fish**, one of Bayer's new southern constellations (1603), situated between Pictor and Hydrus. Part of the Greater Magellanic Cloud lies within its borders.

Dorcas Society, a society for supplying the poor with clothing; so called from Dorcas in the New Testament.

Dorchester. (1.) Municipal bor., mrkt. tn., and co. tn. of Dorsetshire, England. Its 'walks' or boulevards, planted on the line of the Roman wall, add considerably to the attractiveness of the town. The town, the *Durnovaria* or *Durinum* of the Romans, was one of their principal stations. Near it is Maumbury Ring, the most perfect Roman amphi-

theatre in England; p. 9,842. (2.) A suburban district of Boston, Mass. It was settled by Puritans in 1630. Fortifications erected here on March 5, 1776, compelled the British to evacuate Boston. In 1869 Dorchester was incorporated as a part of Boston.

Dorchester Company, a fishing and trading company composed of 'merchant adventurers,' living in and near Dorchester, Eng., the predecessor of the Massachusetts Company of 1629. The Dorchester 'adventurers' founded a fishing station at Cape Ann in 1623, and planned the establishment of a permanent colony, Roger Conant being made manager or governor. The experiment was not successful, the company became involved in debt, and in 1626 the enterprise was abandoned. Meanwhile, under the leadership of Rev. John White of Dorchester, a new association was formed for carrying on the enterprise; this association secured a patent from the New England Council for a tract of territory, and a royal charter—the famous Massachusetts Bay Charter—was secured in March, 1629.

Dordogne. Department, S.W. France, comprised chiefly within the basin of the river Dordogne. It consists mainly of plateaus and hills. The s. produces vines, fruits, and cereals. Lignite, iron ore, and peat are exported. Chestnuts are abundant. The only industry is paper-making. The cap. is Périgueux. Area, 3,561 sq. m.; p. 393,000.

Dordrecht, in English often called **Dort**, tn., prov. S. Holland, Netherlands. It is the birthplace of the two De Witts and of Cuyper and Ary Scheffer. There are sawmills, oil mills, flour mills, iron foundries, sugar refineries, engineering shops, and shipbuilding yards. Here, after shaking off the Spanish yoke, the first states-general met (1572); p. 55,169.

Doré, Louis Christophe Gustave Paul (1833-83), usually Gustave Doré, French artist, was born at Strassburg. His chief pictures are ambitious in both subject and size. *Christ Leaving the Prætorium* (1867-72) and *Christ's Entry into Jerusalem* (1876) are each 30 by 20 ft., but they are defective in drawing and handling. In landscape, however, he was more successful, and some of his mountain scenes are finely conceived. But his reputation rests principally upon the drawings he made to illustrate such books or authors as Rabelais and Balzac, *Don Quixote* and *The Legend of the Wandering Jew*, Poe's *Raven*, Tennyson and La Fontaine, Dante, Milton, and the Bible.

Dore, Monts, a chain of mts., dep. Puy-de-Dôme, France, forming part of the Auvergne range.

Doremus, Charles Avery (1851-1925), Am. chemist, son of R. O. Doremus, born in New York city and educated at the College of the City of New York, and at the universities of Heidelberg and Leipzig. In 1874 he became professor of chemistry and toxicology at Bellevue Hospital Medical College, and from that time continued to instruct at the University of Buffalo, the American Veterinary College, N. Y., and the College of the City of New York. He was well known as an expert chemist in poison-cases, a frequent contributor to scientific journals, and the inventor of several chemical processes of great scientific interest.

Doremus, Robert Ogden (1824-1906), American scientist, born in New York city. He studied chemistry in Paris, and equipped a laboratory in New York, where he was elected professor in the College of Pharmacy. From 1843 to 1861 he was professor of Natural History at the Free Academy, now the College of the City of New York. He was one of the founders of the New York Medical College, of the Long Island Hospital Medical College, and of the Bellevue Hospital Medical College, in which he assumed the professorship of chemistry and toxicology in 1861. He was the foremost chemical expert in criminal cases in New York.

Doremus, Sarah Platt (1802-77), American philanthropist, was born (Haines) in New York city, and in 1821 was married to Thomas C. Doremus, a wealthy merchant of that place. She interested herself in missions at home and abroad, and in 1828 assisted in organizing the Greek relief mission which carried supplies to Greece. She was president of the N. Y. Women's Hospital of which she was one of the founders in 1855. Mrs. Doremus took an active part in hospital work during the Civil War.

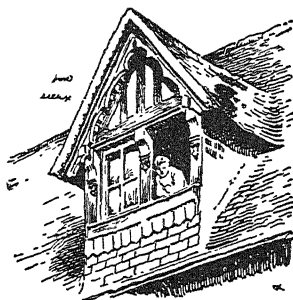
Doric Order, the first of the orders employed in Grecian architecture, became defined in the 7th century B.C., and reached its perfection in the Periclean era, 5th century B.C. Its chief characteristic is a column of massive proportions, channelled into vertical grooves.

Dorion, Sir Antoine Aimé (1818-91), chief justice (from 1874) of the Province of Quebec. As member of Parliament he became leader of the Liberal extremists. Dorion acted as provincial secretary, attorney-general, and minister of justice.

Doris, a small dist. in ancient Greece lying between the ranges of Parnassus and Cēta. It was the mother-country of the Dorian invaders who conquered the Peloponnesus.

Dorking, a mrkt. tn. and par. in Surrey, England. A church commemorates Bishop Wilberforce. Dorking has trade in flour, corn, and lime, and is noted for a fine breed of poultry; p. 7,670.

Dormer, or **Dormer Window**, in Gothic architecture a small window placed vertically on the steep roof of a building, with a sub-roof of its own.



Dormer Window.

Dormitory, a large sleeping apartment fitted up with a number of beds. The term is generally used for the sleeping-room of religious houses, with a range of cells partitioned off on each side; and for the building containing bedrooms in universities, colleges and schools.

Dormouse. The common European dormouse (*Muscardinus avellanarius*) is a small rodent having a rounded, rather bushy tail, nearly as long as the head and body together—about two and a half inches. About six months of the year are spent in sleep in the winter nest. In habits the dormouse is very squirrel-like, living largely on nuts, and spending most of its time in trees and bushes; but it differs in being nocturnal. The head is rather large, with prominent black eyes, pointed muzzle, and large ears, the body compact and thick. The general color is tawny.

Dorsetshire, maritime co. in the s.w. of England. A line of chalk hills traverses the county e. and w. Excellent building stone is quarried at Portland, and also at Purbeck. Dairy-farming receives special attention; large numbers of sheep are also pastured. Area (anc. co.), 988 sq. m.; p. 223,274.

Dortmund, tn., prov. Westphalia, Prussia, is one of the most important industrial centers of Westphalia—having coal mines, iron

and steel works, and breweries. It also produces machinery, hardware, zinc (smelted), bricks, flour, and sawn timber. It possesses some fine old churches and a 13th-century town hall, rebuilt in 1899. It was bombed by the Allies in World War II; p. 321,743.

Dortmund-Weser-Ems Canal, of Prussia, connects the Westphalian coal field (at Dortmund) with the Weser at Münster. It was constructed during the years following 1892, and cost nearly \$20,000,000.

Dory, or **John Dory**, the name of a species of the fish genus *Zeus*, now often applied to all the members of the family Cyttidae.

Dos Passos, John Roderigo (1896-), American author, was born in Chicago, Ill.; educated at Harvard; was in ambulance service in World War I. He wrote *Manhattan Transfer* (1925); *The 42nd Parallel* (1930); *1919* (1932); *State of the Nation* (1944).

Dostoevsky, Feodor Mikhailovitch (1822-81), Russian novelist. Sent to Siberia as a revolutionist (1849). Having settled in St. Petersburg (1861), he became a supporter of the government, attacked nihilism, and published *Injury and Insult* (1861); *Crime and Punishment* (1866; Eng. trans. 1885; New York, 1886), a powerful piece of realistic work; and *Diary of a Writer* (1876-80). This was followed (1879-80) by *The Brothers Karamasov*, and other stories. See *Biography* in German by Brandes (1890), and by N. Hoffmann (1899); also Merezhkovsky's *Tolstoi and Dostoevsky* (1903).

Dou, Gerard (1613-75), Dutch painter, was pupil and companion of Rembrandt. At first he worked at portraiture, then devoted himself to *genre*, interiors, domestic life, etc. Many of his paintings are in Amsterdam, Leyden, and the Louvre. See Van Dyke's *Old Dutch and Flemish Masters* (1895).

Douai, or **Douay**, fort. tn., dep. Nord, France, 17 m. s. of Lille. It contains sugar refineries, breweries, wool, paper, and leather factories, and glass works; p. 33,649. Douai gives its name to the Roman Catholic English version of the Bible authorized by the Pope. The Old Testament was published in 1609 by the English College at Douai (founded by Cardinal Allen in 1568, and closed in 1903), the New Testament having been published at Rheims in 1582.

Doubleday, Frank Nelson (1862-1934), American publisher, was associated with Charles Scribner's Sons, 1877-1895; refounded and edited 'The Bookbuyer'; manager of 'Scribner's Magazine' from its establishment in 1886. From 1897 to 1927 he was a mem-

ber of the firm, from 1900 president, which bore his name and became successively Doubleday, McClure; Doubleday, Page & Co.; and Doubleday, Doran & Co.

Double Entry. See **Bookkeeping**.

Double Flowers are strictly those in which the stamens and pistil are replaced by petals or sepals. Such a flower is incapable of sexual reproduction. The term is, however, sometimes extended to cases in which the petals are abnormally increased in number, but not so as to eliminate entirely the sexual functions.

Double Refraction is a property possessed by most crystals of dividing a ray of transmitted light into two distinct rays, each with its own laws of refraction. The separation is particularly well marked in Iceland spar, in which the phenomenon was first observed, and in which it has been most studied. The theory of double refraction in Iceland spar was given first by Huygens (1690); but the complete theory applicable to all cases forms one of the most brilliant of Fresnel's discoveries (1814-27).

Double Stars are close pairs of stars separable with the telescope, though appearing single to the eye. Not far from fourteen thousand have been registered, but a proportion are only optically double—stars accidentally thrown nearly into the same visual line. The closer kind of double stars are almost invariably binary—that is to say, they give unmistakable evidence of circulation under the influence of their mutual attraction. This discovery was announced by Sir William Herschel to the British Royal Society on July 1, 1802. There is no reason to doubt that double stars obey, in their movements, the law of gravitation. The basis of all calculations regarding them is Kepler's prescription of equal areas in equal times, and no departure from it has, so far, been attested. Stellar systems at known distances from the earth are of readily ascertainable mass and linear extent. Their average joint mass is probably about double that of the sun; but their orbital span is of such immense variety that no standard for it can be established. It is only safe to say that the path of Neptune around the sun would include the tracks of most double stars with periods of less than one hundred years. Double stars frequently form tenary combinations with more remote companions. See **MULTIPLE STARS**.

Doubloon, a gold coin of Spain not struck since 1868, when the peseta (=franc) was adopted by Spain. It weighed 128.63 to

129.43 grains, fineness 900, value about \$5.00. Doubloons are also in circulation in S. American countries.

Doubs. (1.) Department E. France, on the w. slope of the Jura Mts. The area is 2,052 sq. m. The department is very mountainous, the highest summit being Mont d'Or (4,790 ft.). The plain between the Oignon on the w. and the Doubs is very fertile. Chief town, Besançon; p. 298,864. (2.) River, France, rises in the Jura Mts., flows to the northeast for 70 m., descending the cataract of Saut du Daubs (88 ft.), near Morteau. It then enters Switzerland. From Voujeaucourt, near Montbéliard, to Dôle the river forms part of the Rhone and Rhine Canal.

Doughbird, the Eskimo curlew. See **Curlew**.

Dougherty, Denis J., (1865-) cardinal, was the first American bishop of Nueva Segovia, 1903; bishop of Buffalo, 1915; archbishop of Philadelphia since 1918. Made cardinal, March, 1921.

Douglas. (1.) Seaport, mrkt. tn., wat.-pl., and cap. of Isle of Man. The fine outer harbor, opened in 1872, allows vessels to enter at all states of the tide. There is a noble promenade, 2 m. long, round its beautiful bay; p. 19,126. (2.) Parish and vil., Lanarkshire, Scotland, on Douglas Water. St. Bride, now represented by a choir and small spire, was until 1761 the burying-place of the Douglas family. Douglas Castle, in the parish, is the Castle Dangerous of Sir Walter Scott. (3.) City, Douglas I., Alaska, terminus of steamboat line to Tacoma, Wash., and Sitka. The Treadwell gold mines are situated here, and there are large quartz mills; also government schools; p. 1,722.

Douglas, a famous family of southern Scotland. The earliest recorded member of the family is William of Douglas (1174-1213). His grandson, William de Douglas (d. 1298), was frequently in trouble through his resistance to the pretensions of Edward I., and died a prisoner in the Tower of London, being succeeded by his eldest son, the 'Good' Sir James, Lord of Douglas (?1286-1330), companion in arms of Robert Bruce. At Bannockburn (1314) he commanded the left wing of the victorious Scots. On the death of Bruce, Douglas undertook to carry his heart in a crusade against the infidels, and was slain in battle in Andalusia in Spain. The unexampled power the family acquired in Scotland aroused the jealousy of Lord Chancellor Crichton and the guardians of James II., and they sought to crush it after the death of

Archibald, the fifth Earl of Douglas (1439), when the sixth earl, William, a youth of seventeen, was inveigled into Edinburgh Castle, and after a mock trial was executed (1440). William, eighth earl (?1425-52), by his marriage to Lady Margaret Douglas, the Fair Maid of Galloway, in great part restored the power of his house; but his arrogance so incensed James II. that, in a fit of passion, the king stabbed him to death while his guest in the castle of Stirling under a safe-conduct.

The fortunes of the house of Douglas revived in a younger branch of the family. Archibald, fifth Earl of Angus (1449-1514), surnamed 'Bell the Cat,' headed the conspiracy against James III., which led to the king's defeat at Sauchieburn (1488).

Douglas, Lewis Williams (1894-), American public official, was born in Bisbee, Arizona; educated at Amherst and Mass. Inst. of Technology. He was a member of Congress for three terms; Director of the Budget (1933-34); President of McGill University Canada (1937-).

Douglas, Norman (1868-), English essayist and novelist. His works include *Alone* (1921); his best known work *South Wind* (1917); *They Went* (1921); *Old Calabria* (1928); *In the Beginning* (1928); *Three of Them* (1930); *Goodbye to Western Culture* (1931); and his autobiography *Looking Back* (1933).

Douglas, Lloyd C. (1877-), author and clergyman, was born in Columbia City, Indiana. He studied for the Lutheran ministry, was ordained in 1903, and was active in the ministry until 1933. Since then he has devoted his time to writing. His earlier books had an ecclesiastical tinge, but since the publication of *Magnificent Obsession* (1929) he has turned his attention to novels. Among his other books are *Green Light* (1935); *White Banners* (1936); *Disputed Passage* (1939); *Dr. Hudson's Secret Journal* (1939); *Invitation to Live* (1940); *The Robe* (1942). Several of his books have been adapted for motion picture production.

Douglas, Sir Robert Kenaway (1838-1913), English Chinese scholar; born in Devonshire, and entered the Chinese consular service (1858), from which he retired on his appointment as assistant in the Chinese Library of the British Museum (1865), where, after 1892, he was keeper of the Oriental manuscripts and books. He wrote *The Language and Literature of China* (1875), *Confucianism and Taoism* (1877), *Chinese Stories*

(1893), *The Life of Li Hung Chang* (1895), *China* (Story of the Nations, 1899), and other works.

Douglas, Stephen Arnold (1813-61), American political leader, born in Brandon, Vt. He removed with his mother (1830) to Canandaigua, N. Y. He studied law, removing in 1833 to Winchester, Ill., and was admitted to the bar the next year at Jacksonville, Ill. In 1841 he was appointed a judge of the state Supreme Court, and in 1842 was elected to Congress. At the close of a second term as representative (1847), Douglas entered the U. S. Senate, of which he remained a member until his death. He favored the annexation of Texas, the resolute urging of the U. S. claim in the Oregon boundary dispute, and the Mexican War, with the resulting increase of territory in the Southwest. In 1854 Douglas startled the country and alarmed the North by introducing a bill repealing the Missouri Compromise of 1820, which excluded slavery from all territory n. of 36° 30', and permitting the inhabitants to regulate their institutions in their own way. The success of his 'Kansas-Nebraska bill' split the Democratic party and blotted out the Whig party, and brought on the struggle in Kansas that ended in making it a free state. Douglas was devoted to the Jacksonian wing of the Democratic party and was known as the "Little Giant."

In his contest for re-election to the Senate from Illinois, came his famous debates with Lincoln, who was defeated. Breckinridge was nominated for the presidency in 1860 as the candidate of the Democratic extremists, Douglas by the moderate wing. But although Douglas received the largest popular vote next to Lincoln's, he secured only 12 electoral votes. The secession of the South brought him to the support of Lincoln and the Federal government. 'There can be no neutrals in this war,' said he. Less than two months after the war broke out, he died. See Rhodes' *History of U. S.*; *Compromise of 1850* (1903); Brown's *Stephen Arnold Douglas* (1902).

Douglas, William Orville (1899-), U. S. Supreme Court Justice; b. in Minnesota; law degree at Columbia Law School; instructor at Columbia; Sterling prof. at Yale Law School; appd. member Securities Exchange Commission, 1934. Pres. Roosevelt appointed him to Supreme Court, 1939, the youngest man on that tribunal since James Story, at 32, was appointed in 1811.

Douglas Fir. See **Fir.**

Douglass, Frederick (1817-95), American orator and journalist, born of a white father and a negro slave mother, near Easton, Md., and brought up on the plantation until 10 years of age. He was bought by a Baltimore shipbuilder from whom, after teaching himself how to read and write, he escaped, in 1838, in the disguise of a sailor, under the name of Douglass. He worked for a time at New Bedford, Mass. His disclosure of marked oratorical powers led to his employment by the Massachusetts Anti-Slavery Society as a lecturer, and his success on the platform secured him engagements in England, where,



Gaston Doumergue.

after writing his autobiography, he stayed two years, a donation of \$600 enabling him to secure his freedom. From 1847 to 1860 he published an anti-slavery paper in Rochester, N. Y. He was appointed secretary to the San Domingo Commission in 1871; was marshal of the District of Columbia in 1876-81; recorder of deeds in 1881-6, and minister to Haiti from 1889 to 1891.

Doukhobors. See **Dukhobors.**

Doumer, Paul (1857-1932), French statesman, was born of humble parentage. Study-



ADMIRAL SIR FRANCIS DRAKE

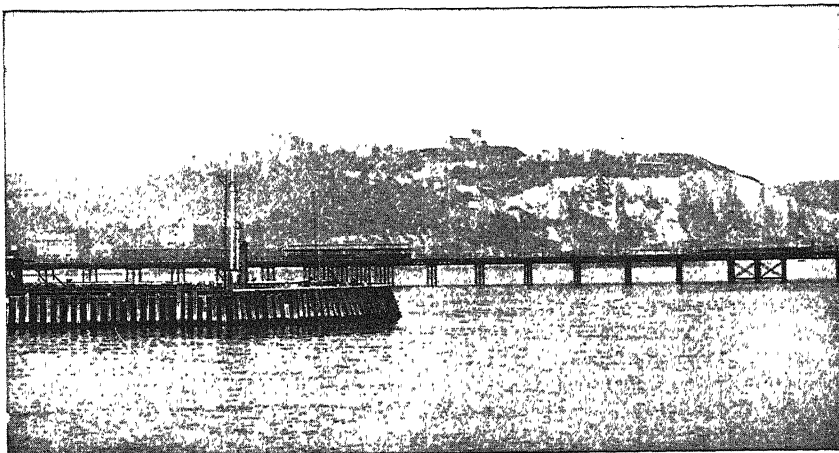
ing in his leisure hours, he took a degree at the Sorbonne and became teacher of mathematics and, later, editor of a provincial newspaper—a short step to politics. He was elected a deputy in 1888, served as finance minister and governor of Indo-China. In 1905 he was elected president of the Chamber, senator in 1912, and in 1931 was chosen President of the Republic by 504 votes against 334 for M. Briand. The next year M. Doumer was assassinated in Paris by Paul Gouguloff, a "white Russian" emigre.

Doumergue, Gaston (1863-1937), French statesman. He studied law and after practis-

director of the *Revue des deux mondes*. His publications include *Etudes sur la littérature française* (1896-1908); *Le théâtre nouveau* (1908); *Lamartine* (1912).

Douro, river of Spain and Portugal, rises in the Castilian plateau. It flows uniformly w. until, after a course of about 480 miles, it reaches the Atlantic, a little below Oporto.

Douroucolis, a name of unknown origin applied to the night-monkeys, or owl-monkeys, found in South America. They are small creatures, the body measuring less than a foot, with long non-prehensile tails (14 inches), round heads, and enormous eyes.



Dover: the Cliffs seen from a Steamer.

ing in Nîmes (1885-90), was a colonial judge in Algiers (1890-1893). Returning to France, he was elected to the Chamber of Deputies, being re-elected in 1898, 1902, and 1906. He was Minister of Commerce and served as Minister of Instruction (1909) in the Briand cabinet. In 1910 he was elected to the Senate and in 1913-14 was premier. He represented France at the Allied conference in Petrograd in 1917, and on his return resumed his seat in the Senate. In 1924 he was elected president of France. He was succeeded in 1931 by Paul Doumer. Called from his retirement in 1934, to serve as Premier, he resigned in November, having been unable to effect proposed constitutional reforms. See FRANCE.

Doumic, René (1860-1937), French critic, from 1883 to 1897 professor of literature at Stanislas College. In 1898 he made a trip to the United States and Canada, where he lectured in the leading universities. He was

Dove, another name for the **Pigeon**. Symbolically the dove has been extensively employed in Christian art to represent innocence and purity. In a more special sense it is symbolic of the Holy Spirit, and as such is seen in representations of the Trinity, of the annunciation, and of the baptism of Christ. The dove holding an olive branch is a symbol of peace; with seven rays proceeding from it, it signifies the seven gifts of the Holy Spirit; a six-winged dove is typical of the Church of Christ.

Dover, parliamentary and municipal borough, England, in Kent, on the coast of the English Channel; 76 miles southeast of London. It is a notable military station and an important seaport, being the point on the British Isles nearest to the Continent. Features of interest are Dover Castle, picturesquely situated on a cliff overlooking the town and the fine Maison Dieu hall found-

ed in the thirteenth century; the museum; the barracks, within whose enclosures are the foundations of a round Church of the Templars; the marine parade, and Shakespeare's Cliff, traditionally associated with King Lear. Dover is an important marine station of England; its broad and spacious harbor comprises the commercial harbor and the Admiralty harbor, enclosed by massive breakwaters, the whole covering an area of more than 600 acres. Textiles, machinery, shoes, and lumber are manufactured; p. 39,985.

During the Great War it was several times the object of submarine and aerial attacks, being bombed frequently in 1916 and 1917. It served as the base for the Dover Patrol which guarded the Straits of Dover, the entrance to the English Channel from the North Sea. During the second World War as well as the first, Dover, "the key to England," was often shelled and bombed from land, sea, and air by the Germans.

Dover, city and State capital, Delaware, county seat of Kent co. The chief buildings are the State House, the armory, the Wilmington Conference Academy (M. E.) and a State industrial school for negroes. The city is in an agricultural and peach-growing district and has several canning and fruit evaporating establishments. The principal manufactures are shirts, silk, lumber, bricks, baskets, and barrels. Dover was founded in 1717 and became the capital of Delaware in 1777; p. 5,517.

Dover, city, New Hampshire, county seat of Strafford co., at the head of navigation on the Cocheco River. Water power is abundant, and manufactures include cotton and woolen goods, machinery, building materials, shoes, lumber, bricks, castings, and leather goods. Dover was settled in 1623, being the first permanent settlement in New Hampshire, and was long exposed to Indian attacks, in one of which, June 27, 1689, about fifty of the inhabitants were either killed or carried off; p. 14,990.

Dover, city, New Jersey, in Morris co. It is a popular summer resort and residential city, and has iron works, boiler works, a steel plant, and manufactures of furnaces and ranges, silk, overalls, and knit goods; p. 10,491.

Dover, Strait of, channel separating England and France, and joining the North Sea and the English Channel. It extends from Dungeness and Cape Grisnez to South Foreland and Calais, a distance of 22 miles. Between Dover and Calais the breadth is 21

miles. Captain Webb was the first man to swim the strait from Dover to Calais, in August 1875, and Louis Bleriot was the first airman to fly across the strait, July 1909. A floating network barrage against German submarines was here maintained during the Great War. (See DOVER). Projects for a bridge over the Strait or a tunnel under it have thus far been unacceptable.

Dovrefjeld, a mountain plateau, Norway, the watershed of the Norwegian rivers. Its highest point is Snehätta, 7,560 ft. above the sea. In popular folklore the Dovrefjeld is regarded as the home of divers spirits, elves, etc.—superstitions which figure in Asbjørnsen's *Norske Huldre Eventyr*, and are turned to excellent account in Ibsen's *Peer Gynt*.

Dow, Herbert Henry (1866-1930), American chemist, born in Ont., Canada. He developed in the commercial company that bears his name many new chemical processes, and served during the World War on the advisory committee of the Council of National Defense.

Dowager, the title given to a widow to distinguish her from the wife of her husband's heir, bearing the same name or title. It is applied chiefly to persons of high rank.

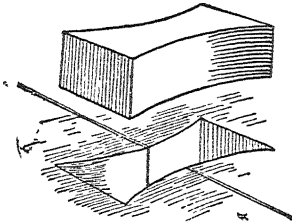
Dowd, Charles Ferdinand (1825-1904), American educator; taught in Maryland, Connecticut, and New York, but is best known as the originator of the scheme of longitude standards for railroad time, popularly known as 'standard time.'

Dowden, Edward (1843-1913), Irish scholar and man of letters, was born in Cork. He became professor of English literature at Trinity College, Dublin, in 1867, a position which he retained until his death. In 1896-1901 he was commissioner of national education in Ireland. He devoted much time to the study of Shakespeare and as a result published *Shakespeare: His Mind and Art* (1875), a *Shakespeare Primer* (1877), *Introduction to Shakespeare* (1893), and editions of the *Sonnets* (1881), *Hamlet* (1899), *Romeo and Juliet* (1900), and *Cymbeline* (1903). Other publications include *Lives of Southey* (1879), *Shelley* (1886), and *Browning* (1904), *New Studies in Literature* (1895).

Dowel, a pin of metal, wood, or stone, fixed into two objects as a bond between them. For connecting blocks of stone, the dowel is fitted transversely to their faces, into grooves cut for the purpose, and cemented firmly in place. Dowels of wood are much used by cabinet makers and joiners in fastening small pieces together, the pin and the

holes being first given a thick coating of glue.

Dower, the provision which the law makes out of the real estate of the husband for the support of his widow and the nurture of her minor children.



Dowel, and Groove prepared

Dowie, John Alexander (1848-1907). In 1888 he proceeded to America, and in 1896 organized 'The Christian Catholic Apostolic Church in Zion,' with himself as supreme head, and founded Zion City (1901-02) on the w. shore of Lake Michigan.

Down, maritime county, Ireland, in Ulster, between Belfast Lough on the n. and Carlingford Lough on the s.; area, 957 sq. m. One-half of the entire area is under crop, mostly oats, potatoes, turnips, wheat, flax, and barley. Many pigs, horses, and cattle are reared for export. The chief manufacture is linen, especially the finer fabrics; p. 204,303.

Downing, Andrew Jackson (1815-52), American landscape gardener, was born in Newburgh, N. Y., where his father was a nurseryman. In 1851 he was commissioned to lay out the public grounds around the National Capitol, the White House, and the Smithsonian Institution.

Downing Street, a famous street in London, England, in which is the official residence of the Prime Minister—No. 10—as well as the Foreign and Colonial Offices. It is named for Sir George Downing, Secretary of the Treasury in 1667.

Downs, The, roadstead, off the coast of Kent, England, extending from North Foreland to South Foreland. It is 8 miles long, 6 miles wide, and from 10 to 12 fathoms deep. Except during southerly gales, ships can anchor safely. The Downs have been the scene of various naval engagements, notably between the Spanish and Dutch fleets in 1639 and the English and Dutch fleets in 1652 and 1666.

Downs, North and South, chalk hills in the s. of England, running eastward, through Surrey and Kent, northward to Dover cliffs,

and through Sussex southward to Beachy Head. They shelter the fertile Weald and form excellent pasturage for the famous Southdown sheep.

Dowry, the property a woman brings to her husband in marriage. It is known in France as the *dot*.

Doyle, Sir Arthur Conan (1859-1930), British novelist, historical writer, and spiritualist, was born in Edinburgh. He studied medicine at the University of Edinburgh and practised at Southsea from 1882 to 1890. After traveling in the Arctic regions and in Africa, he devoted himself to writing fiction, producing in 1887 *A Study in Scarlet*, in which he introduced his famous character Sherlock Holmes, the detective, followed by *Micah Clarke* (1888), *The Sign of Four* (1889), and *The White Company* (1890). In 1896 he was correspondent for the *Westminster Gazette* in the Sudan, and in 1900 was senior physician of the Langman Field Hospital, South Africa. He was knighted in 1902. He has lectured on spiritualism in Europe and in the United States. His published works include *The Adventures of Sherlock Holmes* (1891); *The Memoirs of Sherlock Holmes* (1893); *Songs of Action* (1898); *The Great Boer War* (1900); *The Cause and Conduct of the War*, a spirited defence of British policy in South Africa (1903); *The Hound of the Baskervilles* (1902); *The Adventures of Gerard* (1903); *The Return of Sherlock Holmes* (1905); *Sir Nigel* (1906); *Songs of the Road* (1911); *The Lost World* (1912); *The New Revelation* (1918); *History of the British Campaigns in France and Flanders* (1915-20); *The Vital Message* (1920); *The Coming of the Fairies* (1922); *The Case for Spirit Photography* (1923); *Our American Adventure* (1922); *Our Second American Adventure* (1924); *Memoirs and Adventures* (1924); *The Land of Mist* (1925).

Drachenfels, eminence of the Siebengebirge, in the Prussian province of Rhineland, rises over 1,050 ft. abruptly above the Rhine near Königswinter, and is crowned by the ruined castle of the same name. The Drachenhöhle (dragon's cave), in which lived the dragon slain by Siegfried, is in the side of the rock. Byron refers to the 'castled crag' in *Childe Harold's Pilgrimage*.

Drachma, the name of the chief silver coin among the ancient Greeks. The modern Greeks also use the name drachma for their standard coin, which is nominally equal to a French franc.

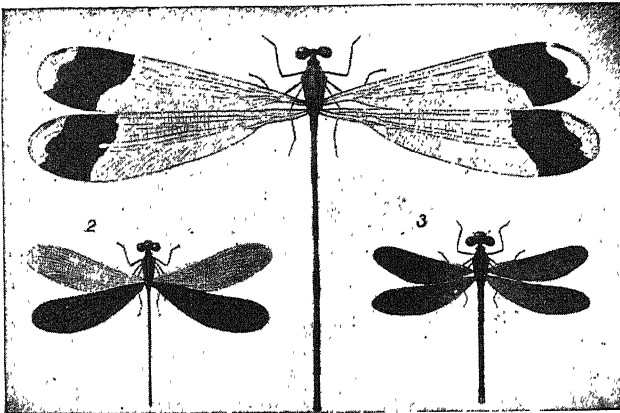
Drachmann, Holger Henrik Herholdt (1846-1908), Danish poet, became early a distinguished marine painter. His earlier works (*Lars Kruse*, 1879) were improvised journalism of the most brilliant kind. His romances are of unequal value; his lyrics rank high, as do his fairy and other tales—e.g. in *Sange ved Havet* (1877), *Ranker og Roser* (1879), *Gamle Guder og Nye* (1881), *Dybe, Streng* (1884), and *Unge Viser*—rank among the treasures of the language. As a writer of fairy and other tales also he has done great things; and some of his dramas bear the impress of genius, notably *Det var engang* (1885), *Volund Smed* (1894), *Brav-Karl* (1897), *Gurre* (1899), and *Hallfred Vandraadeskjald* (1900).

Draco, an ancient constellation. One of

Draco, or **Dracon**, the first lawgiver at Athens, appointed in 621 B.C. to codify and correct the existing law. Of his legislation we only know the provisions of the criminal law relating to the shedding of blood. His name has become proverbial for severity, which, however, is not altogether deserved.

Draft, a written order for the payment of a sum of money addressed to some person who holds money in trust, or who acts in the capacity of agent or servant of the drawer. Documents of this kind often pass between one department of a bank or mercantile house and some other department, and are distinguished from bills of exchange and checks in not being drawn upon a debtor.

Draft Riot, a four days' riot (July 13-16, 1863) in New York city, occasioned by the



Types of Dragon-flies.

1, Megaloprepus; 2, Neurobasis; 3, Calopteryx.

its two brightest stars afforded Bradley, while attempting to verify Hooke's illusory parallax, his discovery of the aberration of light. The n. pole of the ecliptic is close to the famous planetary nebula (N.G.C. 6543) from which Sir William Huggins obtained, Aug. 29, 1864, his first view of the bright-line nebular spectrum.

Draco, or **Flying Dragon**, a name given to certain small tree-dwelling lizards, of which the best known is *Draco volans*, a form from the Malay Peninsula. The special peculiarity is that the body is furnished with wing-like expansion, supported on certain of the ribs, and when not in use folded up like a fan. Owing to their presence, the lizards are capable of taking flying leaps from one branch of a tree to another.

enforcement of the Conscription Act of Mar. 3, 1863. During the four days about 1,000 men, chiefly rioters, were killed and property valued at about \$1,500,000 was destroyed.

Draco Doctrine, a political doctrine first suggested by Alexander Hamilton, later proposed by Carlos Calvo, the Argentine statesman, and more recently brought to the attention of the world by Dr. Luis M. Drago, a learned publicist of Argentina. In brief, the doctrine provides that states should not employ force in seeking to compel the payment of pecuniary claims of their subjects or citizens by other states. At the Second International Peace Conference at the Hague in 1907, the doctrine was presented by Dr. Drago himself in the shape of a provision that 'in the collection of public debts, the debts must be

claimed in the ordinary courts of the debtor country. Through the efforts of Gen. Horace Porter of the American delegation, a compromise declaration was made which definitely established the principle that public debts must not be collected by force except as a last resort.

Dragon, in mythology, a monstrous creature occupying a prominent place in the legendary tales of most Eurasian countries, notably China and Japan. The dragon worshipped by the Babylonians and slain by Daniel (*Bel and the Dragon*, 23-27) was clearly one of the sacred crocodiles of Egypt. At Japanese festivals, the effigy of a huge reptile is dragged through the streets in triumph. In the gypsy tales of S. E. Europe, the *drakos* is sometimes identical with the ogre of nursery tales.

Dragon-fly, a general name for the members of the family Libellulidæ, which belongs to the neuropterous group Odonta. The head is very freely movable, and bears large eyes, while the antennæ are very small; the legs are weak, and are placed far forward; the abdomen is much elongated. As in May-flies, the earlier part of the life is passed in the water. The coloring is often singularly beautiful, but is very fleeting, fading soon after death. See L. O. Howard's *The Insect Book* (1900).

Dragoons were originally much the same as mounted infantry—namely, troops using horses merely for marching purposes, but intended to fight on foot. In the 17th century regiments of dragoons became very numerous in all European countries, being looked upon as intermediate between cavalry and infantry. Toward the end of the 18th century they became pure cavalry. Dismounted cavalry was largely used in the American Civil War, which gave a great impetus throughout the world to this method of fighting, which was called the American fashion.

Drainage. Drainage is here considered as it applies to the removal of surplus water from soil by means of canals, open ditches, covered ditches, and tile or other porous or open-jointed conduits; and to the disposal of sewage and other liquid wastes by means of water-tight pipes or conduits. Of such drainage there are three main classes: Reclamation of large areas of flooded or marsh or swamp lands; farm drainage to control the soil moisture of smaller cultivated areas; and sewerage to dispose of liquid household and farm wastes. Large areas of very fertile lands but slightly above the level of the sea or neigh-

boring streams are often successfully reclaimed by a system of dikes or embankments to keep out flood waters, and canals and open ditches to collect and remove surplus water. The simplest form of farm drainage consists of throwing up land into beds, hills, ridges, etc. The next advance is the use of open ditches and drains. While open ditches are still used more or less, the use of tile has generally superseded all other methods for ordinary farm-drainage. The successful installation of an efficient system of tile drainage requires a careful consideration of the contour of the land, the character of the soil (whether porous or retentive), the rainfall and seepage water to be removed, and similar factors, in order that the location, size, depth, grade, and distance apart of the drains best calculated to secure satisfactory drainage may be accurately determined.

Among the best authorities who may be consulted on the subject of drainage are C. G. Elliott, *Engineering for Farm Drainage* (New York, 1903), and *Drainage of Farm Lands* (U. S. Department of Agriculture Farmers' Bul. 187); and Theobald Smith, *Sewage Disposal on the Farm* (U. S. Department of Agriculture Farmers' Bul. 43).



Sir Francis Drake.

Drake, Sir Francis (1540-96), English naval commander. He joined the ill-fated expedition of John Hawkyns destroyed by the Spaniards (1567). After several South American voyages, in 1578 Drake struck across the Pacific, and returned home by the E. Indies, the Cape of Good Hope, and Sierra Leone, and reached England in September, 1580—the first Englishman that had circumnavigated the globe. He next sailed with a fleet of 25

ships to make reprisals on the Spaniards in the W Indies (1585), and on his return brought back the disheartened colonists from Virginia, and with them, probably for the first time, tobacco and potatoes. In 1587 Drake succeeded in destroying the Spanish shipping in the harbor of Cadiz. When the Armada appeared in the following year, Drake took a leading part in the decisive action off Gravelines. In 1595 he sailed on his last expedition to the W. Indies. The original accounts of his principal voyages are: *Sir Francis Drake Revived*, by his nephew of the same name (1626); *The World Encompassed by Sir Francis Drake*, by Fletcher (1628); and *Sir Francis Drake his Voyage* (1595), by Thomas Maynarde—published by the Hakluyt Society in 1849.

Drake, Francis Samuel (1828-85), American author, son of Samuel G. Drake, was born in Northwood, N. H. His *Dictionary of American Biography* (1872) was twenty years in the making. Its text and his additions up to the time of his death are now incorporated in a larger work thoroughly revised in 1932-1935.

Drake, Friedrich Johann Heinrich (1805-82), German sculptor, was born in Pymont. His marble statue of King Frederick William III., considered to be his finest work, is in the Zoological Garden at Berlin. Drake also executed statuettes of Rauch, Schinkel, the two Humboldts, and busts of Bismarck and Moltke.

Drake, Joseph Rodman (1795-1820), American poet, was born in New York City. His friendship with Fitz-Greene Halleck began in 1812, and in 1819 they contributed to the New York *Evening Post* a series of humorous poems entitled 'The Croakers,' satirizing in a lively fashion public characters and events of the day. In that year also Drake wrote his most pretentious poem, 'The Culprit Fay'.

Drake, Samuel Adams (1833-1905), American author, son of Samuel G. Drake, was born in Boston, Mass. He devoted himself to literary work, publishing a large number of popular legendary and historical works, including *New England Legends and Folklore* (1884); *The Making of New England* (1886); *The Making of the Great West* (1887); *On Plymouth Rock* (1898; 1904); *The Young Vigilantes* (1904).

Drakenberg Mountains, or the **Kathamba**, the great mountain range of Southeast Africa, extending for 500 m. from the Great Fish River to the Olifants River. The

loftiest peaks are Giant's Castle (9,657 ft), Mont aux Sources (11,156 ft), and Champagne Castle (10,357 ft). Many battles were fought in this district during the Boer War.

Drake University, a coeducational institution of learning in Des Moines, Iowa, founded in 1881 and under the influence of the Disciples of Christ.

Drama. Dramatic art in Europe has its source in the ancient Hellenic culture, which, more than two thousand years ago, reached its full development in Periclean Athens. The drama in ancient Greece was developed from the choric hymns and dances of the Dionysian festivals, which were held in Athens in the early part of the year, dramatic representations being given before audiences numbering many thousands, and assembled in a theatre open to the sky. The chief subjects of Greek tragedy were the heroic legends and mythology of Greece. The earliest example of the Greek drama that has survived is the *Persæ* of Æschylus (525-456 B.C.), the first piece of a trilogy which won the prize in the year 472 B.C. In dramatic interest, though not in power, Æschylus was surpassed by Sophocles (c. 495-405 B.C.), by whom he was defeated in public contest. Euripides, the third of the three great masters of Greek tragedy, represents it in a less heroic form. But it was in Euripides, rather than in his greater predecessors, that the Roman tragic poets found their favorite inspiration; and it was on him, as adapted by the Romans, that the classical model of France was founded. With the death of Euripides, at the end of the 5th century B.C., Greek tragedy ends for us, though it survived in Athens to the days of Alexander the Great, and in Alexandria until the 2d century of the Christian era.

Greek comedy found its greatest master in Aristophanes, a younger contemporary of Euripides. His successors are associated with later developments of comedy known as the Middle and the New Comedy. The greatest of them are Philemon and Menander. The influence of these writers has been even more directly traceable in the modern drama than that of the tragic poets. The situations which they first devised and the comic characters which they invented have become the immutable conventions of the stage.

The indigenous Latin drama was represented by the *mimi*, a species of primitive and vulgar farce, and the Atellane Fables, in which the actors improvised their parts. Serious dramatic art began with Livius Andronicus. The only part of Roman tragedy that has survived

is that associated with the name of Seneca, who adapted very freely the masterpieces of Sophocles and Euripides, though his plays were intended for reading, and not for the stage. He was taken as a model by the great French writers who founded the classical tragedy of France.

In comedy the Romans began, as in tragedy, to borrow directly from the Greek. Plautus, who was born in the middle of the 3d century B.C., borrowed his plots from the Greek, but to his characters and dialogue he gave a flavor of his own, and to him more than any one Molière was indebted Terence, who was a generation later than Plautus, followed the Greek comedy writers even more closely, and it is through him that we gain most of our knowledge of Menander. After Terence, Roman comedy assumed a more native character, and then degenerated into licentiousness and farce.

To the drama in all its forms the early Christian church was uncompromisingly hostile, and for centuries the dramatic art ceased to exist. From the complete ascendancy of the church in the Middle Ages were evolved the morality plays, mysteries, and miracle plays, of which a survival is to be found in the Oberammergau Passion play of the present day. The revival of the drama may be said to have begun with the 16th century. In Italy, tragedy on the classical model was then first produced; and the pastoral dramas of Tasso and Guarini, towards the middle of the century, form, according to Schlegel, an epoch in the history of dramatic poetry. In Germany the drama was of slower growth. The influence of the French tradition was paramount until the middle of the 18th century, when Lessing broke the spell and introduced Shakespeare to the German stage. Then came the vivifying influence of Goethe's genius, and the historical tragedies of Schiller, which completed the emancipation from the French influence.

In France the national drama may be said to have begun in the middle of the 16th century; but the classical era opens with Pierre Corneille (1606-84), who formed the model which not only profoundly influenced dramatic art in every other country, but which dominated French dramatic literature altogether. The classical model was more deeply fixed by Racine, in whom it found its highest exponent, and who was followed by Voltaire. Diderot endeavored to make a new departure with his plays of family life, known as *le drame bourgeois*; but his productions

had no success. Although the influence of the French school of tragedy was so profound, it is not in tragedy but in comedy that the glory of French dramatic literature is to be found. In Molière (1622-73) France possesses the greatest master of comedy that the world has known. It was in recognition of Molière's genius that Louis XIV., in 1680, founded the Comédie Française. In the latter part of the 18th century, in France, the name of Beaumarchais is memorable as the author of *The Barber of Seville* and *The Marriage of Figaro*.

In the early part of the 19th century the classical tradition in France was for a time overwhelmed by the great romantic movement, in which Victor Hugo and Dumas père are the leading figures. The period of the Second Empire was dominated by Emile Augier and Scribe, the former of whom introduced what is known as *la haute comédie*. It was in this period, too, that Victorien Sardou first came to the front. It is in his plays, such as *Fédora* and *La Tosca*, that the genius of Sarah Bernhardt found its favorite expression. With the fall of the empire appeared 'the naturalistic school,' typically represented by the comedies of Henri Becque and the problem plays of Alexandre Dumas fils. To this tendency came the reaction in the latter years of the 19th century, when a revival of the romantic and poetic drama was brought about by Richepin, Rostand, and François Coppée.

As in England the drama in Spain burst suddenly into almost full growth in the middle of the 16th century. Cervantes first raised it to the dignity of an art; and the inexhaustible creative genius of Lope de Vega, who died in 1635, and of his disciples, enriched Spain with a wealth of dramatic literature. Calderon, who died nearly half a century later, was almost as prolific as de Vega; but with him the wonderful upspringing of a national drama ceased. There was no attempt, in the Elizabethan drama, even when it drew upon Roman and Greek history for its subjects, to follow the classical model. The unities were ignored; the new drama made its own rules as it went along, except that it adopted the division into five acts which had been prescribed by Horace. Marlowe, the predecessor of Shakespeare, Peele, Greene, Webster, Tourneur, Massinger, Middleton, Beaumont and Fletcher, Heywood, Ben Jonson, Ford, and Dekker are only the brighter stars in this wonderful constellation. In sixty years no less than seventeen theatres were built in London

alone. This great burst of poetic and romantic drama was altogether extinguished in the Puritan ascendancy in 1642.

When the theatres were reopened at the Restoration, it was the French taste and model that dictated and informed the dramatists of Charles' reign. Otway (1651-85), whose *Venice Preserved* is admitted to be one of the finest tragedies in the English language, is the only dramatist of the Restoration period in whom some of the spirit of the Elizabethans is traceable. With Etherege, Congreve, Wycherley, Farquhar, and Vanbrugh, in whom the French influence was paramount, English comedy reached at once a higher and a lower level than it has ever touched again. In the reign of Anne the stage was purged of much of its intolerable grossness, in obedience to a public opinion which found expression in Jeremy Collier's famous *Short View of the Immorality and Profaneness of the Stage* (1697), and enforcement of that censorship which Sir Robert Walpole established in 1737. But in this polite age the effort was still to follow the traditional classical model on which Addison's tragedy *Cato* was founded, and of which another survival appeared in Dr. Johnson's solitary dramatic work, *Irene*. The sentimental dramas of Sir Richard Steele had indeed marked a new departure; but the death-blow to classical tragedy was given by David Garrick's revivals of Shakespeare, illumined with the histrionic genius of England's greatest actor. Comedy in this later 18th-century period had a new birth in Oliver Goldsmith's *Good-natured Man* and *She Stoops to Conquer*; but the true comedy of manners was only fully restored by Richard Brinsley Sheridan in *The Rivals* and *The School for Scandal*.

At the opening of the 19th century the drama had sunk to a low ebb. Sheridan Knowles' tragedy *Virginius* is the only production of consequence that the first quarter of the century records. The production of Robertsonian comedy at the little Prince of Wales' Theatre off Tottenham Court Road (1865-71), with Marie Wilton, Squire Bancroft, John Hare, and the Kendals in the company, begins really the history of the modern drama in England. The Robertson plays introduced a much healthier tone. *Society, Ours, School*, and *Caste* were a revelation to the playgoers of the sixties, and served to introduce not only the modern manner of mounting plays, but the modern style of 'natural acting.' Sir Henry Irving perhaps did more for the dignity of the modern stage

than any other man. It was as Matthias in *The Bells* (1871) that he first achieved fame; but in 1874 his Hamlet raised him to a higher plane as an interpreter of England's greatest dramatist; and this production was followed by a series of Shakespearean revivals, in which the splendor of the mounting was only second in attraction to the acting of Henry Irving and Miss Ellen Terry.

After the vogue of the Robertson plays had been exhausted, the English drama again fell under French influence. Meanwhile, in the eighties, melodrama flourished exceedingly. Drury Lane, under Augustus Harris, produced the sensational dramas of Pettitt and Meritt, to develop later into the spectacular dramas of Cecil Raleigh. Another development of the greatest value to the English stage in freeing it from foreign domination was the remarkable and prolific partnership of Sir W. S. Gilbert and Sir Arthur Sullivan, which began in 1875 with the production of *Trial by Jury*, and which for nearly twenty years delighted England with a new and wholly native form of comic opera. *H. M. S. Pinafore* (1878), *Patience* (1881), and *The Mikado* (1885) remain models of their kind. Gilbert's *Pygmalion and Galatea* (1871) was one of the great comedy successes of its day.

The British drama, at the close of the eighties, was on the eve of a great revolution. The influence of the naturalistic school of France—headed by M. Antoine of the Théâtre Libre—had begun to make itself felt. Ibsen had begun to write for the stage in 1853, but it was not until 1889 that one of his plays, *The Doll's House*, was staged in England. Pinero, in 1893, produced *The Second Mrs. Tanqueray*, a play which at once placed him in a rank apart from all other English dramatists. While Sir Arthur Pinero is the unquestioned pioneer and leader of English dramatists, another playwright of exceptional power and versatility appeared side by side with him. Pinero began with farce and light comedy; Henry Arthur Jones began with melodrama. His *Silver King*, as sheer melodrama, is incomparably above anything of its kind produced at the time; *The Liars* (1897) is the richest, most natural, and most sustained of modern English comedies.

The long-continued barrenness of the English drama, redeemed by Pinero and Jones, was further removed by a group of writers who came to the front in the last decade of the 19th century. Sydney Grundy for nearly twenty years devoted himself to adapting from the French. *Sowing the Wind* (1893) is

perhaps the best example of his original work. Another talent of great promise was revealed in 1892, when Oscar Wilde's play, *Lady Windermere's Fan*, was produced, followed by *A Woman of No Importance*, *An Ideal Husband*, and *The Importance of Being Earnest*. No list of modern playwrights would be complete without the name of George Bernard Shaw. His brilliant burlesque of the romantic and chivalrous ideal in *Arms and the Man* (1894) set all London laughing; of his later plays, several have been privately produced, notably *Mrs. Warren's Profession*, acted by the Stage Society in 1902. Following Mr. Arnold Daly's almost sensationally successful production, *Candida*, in New York, the Vedrenne-Barker management at the Court Theatre, London, produced a series of Shaw plays with signal success, beginning with *Candida*, April 26, 1904. Since 1908, Mr. Shaw has, somewhat perversely, written critical essays in dramatic form. Of modern English playwrights, Shaw is the only one to achieve vogue on the Continent, where he is known as the leader of the English school.

Sir James Barrie first made his mark with *The Professor's Love Story* and *The Little Minister*, which are still enormously popular; but his real talent was revealed only in 1903, when his comedies, *Quality Street* and *The Admirable Crichton* were produced. In *Peter Pan* (1904), *Alice-Sit-by-the-Fire* and *Pantaloon* (1905), and *What Every Woman Knows* (1908), he has firmly established himself as a humorist no less original than Mr. Shaw. Sir Anthony Hope has also written successfully for the stage, his most notable efforts being *The Adventures of Lady Ursula* and *Pinkerton's Peerage*. John Galsworthy has made a notable contribution of several serious plays which are inspired by an earnest purpose to indicate the necessity of various social reforms. His most important plays are *Strife* (1909), *Justice* (1910), *The Pigeon* (1914), and *Loyalties* (1921). The greatest achievement in the reunion of literature with drama stands to the credit of Stephen Phillips, whose tragedy, *Herod*, was produced by Sir Herbert Beerbohm Tree in 1900. Shakespearean production was simplified by H. Granville-Barker, who, inaugurating in England what is called 'the new stagecraft,' produced the plays of Shakespeare more nearly in conformity with the conventions of the Elizabethan stage.

The great success which attended Tree's dramatic version of *Trilby* in 1895 set a fashion in the dramatization of popular novels

which reached its height in 1900, when *The Three Musketeers* of Dumas was staged in as many versions as the protagonists of the story. The outbreak of the World War in 1914 put an end to a period of the English drama. A separate development from that of the British drama is that of the Irish National Theatre, which was organized at the outset of the 20th century by W. B. Yeats and Lady Augusta Gregory. The Irish National Theatre was made illustrious by the genius of J. M. Synge with such eloquent plays of peasant life as *Riders to the Sea* (1904) and the *Playboy of the Western World* (1907). Other Irish dramatists of marked ability are T. C. Murray, Lennox Robinson, St. John G. Ervine, and Lord Dunsany.

Until the middle of the last century the American theatre depended almost wholly upon England for its plays and even for its players. In earlier days, owing to Puritan prejudice, playhouses were few and more or less under a social ban. The first native dramatic author of any note was William Dunlap (1766-1839), who wrote and arranged more than fifty plays. The Park Theatre, opened in New York in 1798 with *As You Like It*, saw the *début* of John Howard Payne, whose *Brutus* was the first drama of importance written in this country. A Philadelphian, Edwin Forrest (1806-72) won renown by his representations of Othello, Lear, and other Shakespearean rôles. Charles Burke, Charlotte Cushman, the elder John Drew, William E. Burton, E. L. Davenport, John Gilbert, John Brougham, the elder Sothorn, Maggie Mitchell, Matilda Heron, and Laura Keane, were conspicuous during the twenty years that preceded the Civil War. Following them into prominence came Edwin Booth, Joseph Jefferson, Lester Wallack, John McCullough, Lawrence Barrett, Rose Coghlan, Clara Morris, Fanny Davenport, Mary Anderson, and Ada Rehan.

About 1875 new theatres began to spring up like mushrooms all over the country. The number of actors in the United States in 1870 has been estimated at 500; today there are upon the professional rolls over 10,000 names. Among America's well-known actors may be mentioned Joseph Jefferson, Edwin Booth, Lester Wallack, W. J. Florence, James Lewis, John T. Raymond, Mrs. Anne Gilbert, Richard Mansfield, John R. Stoddart, E. H. Sothorn, John Drew, William H. Crane, David Warfield, Otis Skinner, Henry Miller, Francis Wilson, Minnie Maddern Fiske, Marie Dressler, Annie Russell, Julia Marlowe, Ethel Bar-

rymore, Mrs. Leslie Carter, Maude Adams, Blanche Bates, Maxine Elliott, Virginia Harned, Viola Allen, Walter Hampden, Lionel Barrymore, John Barrymore, Katherine Cornell, Eva Le Gallienne, Lynn Fontanne, Alfred Lunt, Helen Hayes, George Cohan (author and actor), Jane Cowl and Noel Coward.

Since 1880 Europe has sent many stars to the United States. An increasing number of English plays have been brought to America. Noted ones are: Galsworthy's *The Silver Box*; John Drinkwater's *Bird-in-Hand* and *Abraham Lincoln*; Noel Coward's *Bitter Sweet*; R. C. Sheriff's *Journey's End*. Since the passage of a law protecting foreign copyrights (1891) American plays have greatly increased in number. In 1870 Bronson Howard wrote *Saratoga*, a sketch of life at that summer resort, which found favor with Augustin Daly's audiences, and proved to be the first of a series including *The Banker's Daughter* (1878), *The Henrietta* (1887), *Shenandoah* (1889), a war play of stirring interest, and *Aristocracy* (1892), in which Howard reached his highest level. In 1880 the late Steele Mackaye's *Hazel Kirke* was produced at the Madison Square Theatre, N. Y., where it ran for nearly a year. Denman Thompson's *Old Homestead* (1886); James A. Hearne's *Shore Acres* (1896), and *Sag Harbor* (1899) were most popular. Augustus Thomas wrote, among others, a series of plays of Western Life, of which *Arizona* was the most successful. In some of his plays Clyde Fitch did for the town what Thomas did for the mining camp and Denman Thompson for the farm. His last works included *The Girl with the Green Eyes* (1902), *The Truth* (1906), and *The City* (1909). In skill and intelligence Fitch stood at the head of American playwrights. Eugene Walter's best plays, *Paid in Full* and *The Easiest Way* were produced in 1907 and 1908. David Belasco's *The Girl I Left Behind Me* (1893), *Madam Butterfly* (1900), and *The Darling of the Gods* (1901), which he both wrote and produced marked an epoch in American stage management. David Warfield, by his remarkable acting, added to the success of Charles Klein's *The Music Master*.

A later development in the American drama is what is known as the Harvard School: William Vaughn Moody, with *The Great Divide* (1907) and *The Faith Healer* (1909); Percy Mackaye, with *Joan of Arc* (1906), and Edward Sheldon with *Salvation Nell*

(1908) and *The Nigger* (1909). Several noted actors, such as E. H. Sothern and Richard Mansfield distinguished themselves by productions or adaptations of importance such as the former's production of Hauptmann's *The Sunken Bell*, and the latter's production of *The Misanthrope*, *Don Carlos*, and *Peer Gynt*. The World War exercised less of an interruption to dramatic authorship and theatrical enterprise in America than in any of the European countries; and in the aftermath of the war, New York has become the dramatic metropolis of the world. Plays are now imported to New York from every country in Europe, and the greatest acting companies are brought over intact to demonstrate their art in their own languages. At the same time native American authorship has been so encouraged by the expansion of the theatre that there are now at least two hundred practicing American playwrights whose names are fairly well known to the public.

The Little Theatre movement has done much to stimulate a more widespread interest in, and knowledge of, the artistic problems of the drama. One Little Theatre group, The Provincetown Players, is directly responsible for the development of the most notable American dramatist of the younger generation, Eugene O'Neill. After writing a dozen one-act plays of peculiar originality and power, Mr. O'Neill, with *Beyond the Horizon* (1920) and *Anna Christie* (1922) twice won the Pulitzer Prize for the best American play of the year. Among successful plays recently produced are *Strange Interlude*, *Ah, Wilderness*, Eugene O'Neill; *Street Scene*, Elmer Rice; *The Green Pastures*, Marc Connelly; *Elizabeth the Queen*, Maxwell Anderson; *Tomorrow and Tomorrow*, Philip Barry; *The Barretts of Wimpole Street*, Rudolf Besier; *Men in White*. See THEATRE GUILD.

While in the early 1930's the stage in the United States declined greatly because of severe competition from motion pictures, the middle 1930's saw a revival in the legitimate stage. Pulitzer awards went to Zoe Akins for *The Old Maid* (1935), Robert Sherwood for *Idiot's Delight* (1936), Kaufman and Hart for *You Can't Take It with You* (1937), Thornton Wilder for *Our Town* (1938), R. E. Sherwood for *Abe Lincoln* (1939), W. Saroyan for *The Time of Your Life* (1940) (he declined it), and Robert E. Sherwood for *There Shall Be No Night* (1941).

Drama League of America, an organization formed in Evanston, Ill., in 1910, with

the object of encouraging the writing and production of creditable plays.

Draper, Andrew Sloan (1848-1913), American educator, was born in Westford, N. Y. and was first commissioner of education of the State of New York.

Draper, Daniel (1841-1931). American meteorologist, born in New York. For 36 years he was director of the New York Meteorological Observatory.

Draper, Henry (1837-82). American scientist, son of John W. Draper. He constructed an astronomical observatory at Hastings, N. Y., the lens of whose reflecting telescope he personally made, and with which he took remarkable photographs.

Draper, John William (1811-82). Anglo-American author and scientist. He made researches into the chemical action of light, radiant energy, spectrum analysis, the chemistry and physics of living organisms, photography, etc. In 1856 Draper issued his *Human Physiology, Statistical and Dynamical*, and in 1863 his principal book, *History of the Intellectual Development of Europe*.

Draper, Lyman Copeland (1815-91). American historian and authority on the Indian wars, born near Buffalo, N. Y. He published *Madison, the Capital of Wisconsin* (1857); *King's Mountain, and its Heroes* (1881).

Draught. (1) The current of air which supplies oxygen for the combustion of fuel in a boiler furnace. Natural draught is obtained in a stationary furnace by means of a tall chimney, which becomes filled with heated and ascending gases, caused by combustion, and induces a rapid current of outer air through the furnace to take their place. (2.) The draught of a ship is the depth of water which she displaces when floating; usually marked in a scale of feet on the bow and stern of the vessel. (3.) The term draught in stone-masonry is applied to the chiselled strip which is always cut along the edges of a squared stone, and to which the face may be dressed off if required.

Draughts. See **Checkers**.

Drave (Ger. *Drau*), r. bk. trib. of the Danube; rises at an alt. of 5,480 ft. in Tyrol, flows e. through Tyrol, Carinthia, and Styria, and e.s.e. through Hungary, separating Hungary from Yugo-Slavia, until it joins the Danube a few miles e. of Eszek. Its length is 450 m., of which 380 (from Villach downwards) are navigable.

Dravidian, the Sanskrit name for the languages and inhabitants of S. India. The chief

Dravidian languages are divided into cultivated dialects. Telugu, Tamil, Kanarese, Malayalam, Tulu, Kodagu; uncultivated dialects. Gond, Khond (or Khand), Kota, Toda, Oran, Rajmaahal. At one time the Dravidian tribes ranged also northwest to Baluchistan, where they appear to be still represented by the Brahui; but by union with the invading Aryans the northern Dravidians were assimilated in type and speech to the Hindus. The extinct Dravidian mother-tongue, which was unquestionably a stock language unrelated to Kolarian or to any other known form of speech, is still represented by over twelve distinct languages, spoken collectively. These languages are not mere dialects, but differ from one another as widely as French and German, though they unquestionably emanate from a common Dravidian source.

Drawbacks. For several centuries it has been the custom with exporting nations to remit, upon the exportation of goods, all or part of the excise duties collected upon manufacture of such goods, or, if the goods are of foreign origin, the customs duties levied upon importation. In many cases, also, drawbacks have been allowed upon the exportation of goods made in whole or in part of imported materials, the amount of drawback being determined by the duties paid on the imported materials. In the United States the drawback system was introduced in 1799. By act of that year, imported goods, exported in the original packages, and goods of domestic manufacture subject to excise duty, were upon exportation granted drawbacks equal to the duty. With the vast development of excise taxation at the time of the Civil War the drawback system assumed great importance. On goods manufactured wholly of imported materials on which duties had been paid, drawbacks equal to 90 per cent. of such duties were allowed by act of August 5, 1861. Under the existing law, on goods manufactured from imported materials drawbacks equal to 99 per cent. of the duties paid on such materials are allowed, provided the manufacture takes place under such conditions that the quantity of such materials in the finished product is determinable by the customs administration. The conditions imposed are, however, so onerous that manufacturers find it difficult to take advantage of the drawback privilege. In 1905 greater liberality in the system was introduced.

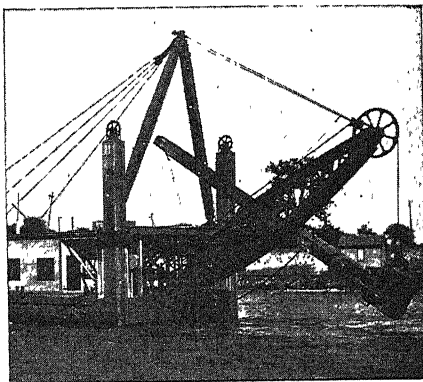
Drawing is a method of expression or description—expression of thoughts, sentiments, or emotions; description of ideas or objects.

Drawing of expression includes all artistic work—drawing in pictures, in decorative design, and in pictorial book illustration, or, as it should be termed, book decoration. All mechanical drawing may be classed under descriptive drawing; but descriptive drawing also includes all purely illustrative drawing, all drawing the purpose of which is to illustrate or make clear some written description, such as is found in books on natural history, botany, medicine, books of travel, etc. All descriptive drawing depends for its value on its scientific accuracy, and has not necessarily any value as decoration. Mechanical drawing is generally understood to mean engineering drawing; it also properly includes architectural drawing. The power to sketch freely without the aid of instruments, popularly called 'freehand drawing,' is a valuable aid to both the architectural and engineering draughtsman. Only by practice can this power be acquired.

Drayton, Michael (1563-1631), English poet and dramatist, born at Hartshill, Warwickshire. Between 1593 and 1597 he wrote voluminously in all the regular Elizabethan forms of verse—pastorals, sonnets, versified chronicles, legends, and the like. His poetry is much influenced by Spenser; its merits lie in vigor of conception rather than in literary finish. Most of his plays were written for Henslowe, the manager of the chief rival company to that of which Shakespeare was a member. *Sir John Oldcastle* (1600) is the chief extant play in which Drayton appears to have had a hand. Little more is heard of him until the publication of the first part of his great topographical poem, the *Poly-Olbion* (1612). See O. Elton's *An Introduction to Michael Drayton*, with bibliography (1895).

Dreaming. Physiologically, sleep is marked by regular and slowed respiration, increased excretion of carbon dioxide, increased absorption of oxygen, slowed pulse, lowered blood-pressure, more active skin glands, temporarily increased then decreased reflexes, lowered temperature, cessation of voluntary muscular motion. In the state of drowsiness, the reflexes, which depend on the lower nerve centers—cord and medulla—may be increased. Sudden starts on falling asleep are an instance. Dreaming is the subjective counterpart of the process of falling asleep and of awakening from sleep. Now the gradual passing of the higher nerve centers, the highest centers of the cerebral matter, from normal to subnormal activity, or rest, removes from

the lower centers a certain inhibition, and these respond more readily both to external stimuli and to altered internal stimuli or tension of blood-vessels. Accompanying this functional dissolution of the higher centers there is, in varying degrees, dissociation of consciousness, or obstructed association. This may manifest itself as a false perception during drowsiness, as where the words of a book appear to become transformed, and where the objects of the environment seem to pass into living things, or as a fully-developed hallucination during deeper sleep, or in various grades between those extremes. The gradation from slight dissociation to the profound dissociation involving double personality is perfect. The result of such dissociation is interference with judgment, resulting in false perception, illusion, hallucination, and perpetually altering variations of these. In all forms of dissociation such false perceptions occur, as has been



An 8-Yard Dipper Dredge.

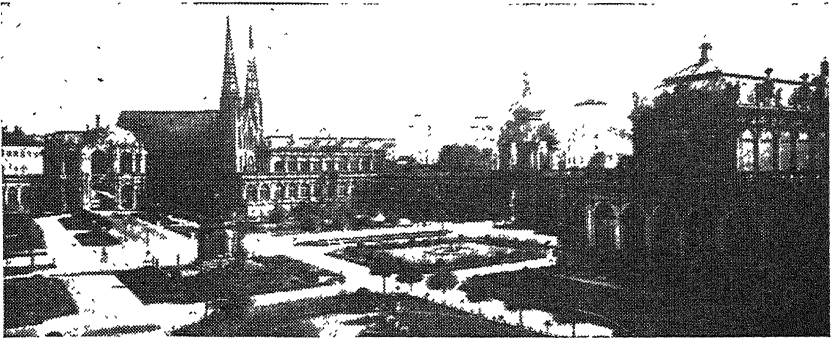
shown by Edmund Parish (*Hallucinations and Illusions*, 1897). Dreams may thus be defined as the illusions and hallucinations resulting from the dissociation of consciousness due to the functional dissolution of the higher cerebral centers.

The illusions and hallucinations of sleep are strictly comparable in themselves to those of insanity. In some forms of insanity the dream passes from normal to pathological. A perpetually recurring dream, for example, may be the first sign of cerebral exhaustion. The essential difference between dreams and permanent hallucinations of the insane is that dreaming is a normal accompaniment of a periodic physiological process, while insane hallucinations are due to special

lesions. The particular illusion and sequence of ideas depend on the individual experience, on the previous environment, on the mental disposition, and on the emotional tone. The organic sensations play an enormous part in the emotional tone of dreams. Perspiration, circulation, digestion, etc., all readily induce dreams on the least interference. Palpitation induced by wrong posture may result in great dream excitement, as of escaping from enemies. Impeded respiration may mean nightmare.

Dreams may be largely remembered, and thus contribute suggestions and ideas to the waking life. See Hutchinson's *Dreams and their Meanings* (1901); Havelock Ellis' *The World of Dreams* (1911); S. Freud's *The Interpretation of Dreams* (1913).

what is now Minnesota, where slavery was prohibited by the Missouri Compromise of 1820. In 1838 Dr. Emerson with Scott returned to Missouri. After the death of Dr. Emerson, Scott was hired out, was harshly treated and finally, in 1848, having learned that by previous decisions of the Missouri courts his residence in free territory had made him a free man, brought a suit against his owner, Mrs. Emerson, for assault and battery. The Circuit Court of St. Louis co., gave a verdict in Scott's favor, but the case was appealed, and the Supreme Court of the State reversed (1852) the decision of the Circuit Court, and soon afterward Mrs. Emerson sold Scott to J. F. A. Sandford, a citizen of N. Y. Scott then (1854), on the ground that he and Sandford were citizens of different



View in Dresden

Dredging is the name given by engineers to the operation of excavating soil or rock under water and depositing it in scows or barges for conveyance to land or out to sea. The appliances used for dredging vary from the primitive and simple 'bag-and-spoon' to the complicated steam 'hopper' dredger. Several of these types are 'clamshell,' center ladder bucket, 'pump' or 'suction,' hydraulic, and 'dipper' dredgers. Dredging has assumed great proportions and has resulted in the construction of the sea-going dredge with the 'hopper' well in the dredge itself. Consult Cunningham's *Dock Engineering*, and the recent volumes of the engineering journals and society publications.

Dred Scott Case, a case of great importance decided by the U. S. Supreme Court on March 6, 1857. Dred Scott was a negro slave of Dr. Emerson, an army officer stationed in Missouri, who removed (1834), taking Scott with him, to Illinois, where slavery was prohibited by State law, and then (1836) to

States, brought suit for assault and battery against Sandford in the Federal Circuit Court for Missouri, and the case finally reached the Supreme Court of the United States. Scott's suit was argued in the Supreme Court in 1856. The decision was not given until 1857. Scott was declared not to be a citizen of Missouri and to have no standing in the Federal courts; a slave was only a piece of property; and it was the right of every citizen to take his property wherever he desired, when the territory was within the jurisdiction of the United States. The court, moreover, Curtis and McLean dissenting, went further and declared that no negro could be a citizen of the United States, that the Missouri Compromise was unconstitutional, and that neither Congress nor the Territorial governments could prohibit slavery in the Territories. The decision caused intense excitement throughout the United States, and was of immense importance in the history of the conflict over slavery. The Fourteenth Amendment (1868)

finally definitely declared negroes to be citizens.

Dreikaiserbund, or **Three Emperors' League**, was an alliance formed by Germany, Austria, and Russia, through the instrumentality of Bismarck (1872). After a three days' consultation at Berlin, it was agreed that in all important international affairs the three powers should consult each other and thus preserve the peace of Europe.

Dreiser, Theodore (1871), American journalist and novelist, was born in Terre Haute, Ind. He was editor of *Smith's Magazine* (1905-06) and of the *Broadway Magazine* (1906-07); and editor in chief of the Butterick publications (1907-10). His published works include: *Sister Carrie* (1900); *Jennie Gerhardt* (1911); *A Traveller at Forty* (1913); *The Titan* (1914); *A Hoosier Holiday* (1916); *Free, and Other Stories* (1918); *An American Tragedy* (1925).

Dreissena, a genus of bivalves, in the mussel family (Mytilidæ), peculiar in having the mantle halves almost completely united.

Dresden, city, Germany, capital of Saxony. A ring of attractive suburbs surrounds the city, among them Loschwitz, where Schiller lived and wrote (1786-7), and Pillnitz, a summer residence of the Saxon court. By reason of its situation and its art treasures, Dresden was called by Herder the 'German Florence.' It occupies an especially important position in the history of art, as the cradle of rococo design, which culminated here about the middle of the 18th century. The handsome royal opera house (1869-78), and the vast pile known as the Zwinger, in which are preserved a choice and very valuable gallery of old masters and other collections, are among its notable buildings.

Dresden also possesses the Johanneum Museum, which contains an art gallery, historical museum, and a fine collection of porcelain; a national industrial art museum; a municipal museum; fine monuments of Carl Maria von Weber (who is buried in Dresden), Goethe and Schiller, Luther, King John, Körner, and other celebrities, by such artists as Rietschel, Hähnel, Schilling, and Kircheisen. Dresden's fame as a center of artistic and intellectual activity is supported by its conservatory of music and by its technical high school. It has three municipal theatres, of which the Court Theatre is one of the most celebrated in the world. The so-called 'Dresden china' is manufactured not at Dresden, but at Meissen. A considerable

trade is carried on by means of the Elbe; p. 619, 157.

Dresden was originally a Slav fishing hamlet. Its period of greatest splendor falls between the end of the 17th century and 1735. In 1813 it was the center of operations against Napoleon, who on Aug. 26-27 here defeated the allies. It was occupied by the Prussians in 1866, but was evacuated the following year.

Dressler, Marie (1873-1934), actress, born in Cobourg, Canada, made her early appearances with various operatic companies. In 1906 she joined the Weber Co., New York, as leading woman. *Tillie's Nightmare* on the stage, and *Tillie's Punctured Romance* (1916), on the screen, with Charles Chaplin, were comedy successes. She returned to motion pictures in 1926 and made many popular films, including *Anna Christie*; *Dinner at Eight*; *Tugboat Annie*; *The Late Christopher Bean*. Greatly loved by the American public, she took a prominent part in the Liberty Loan drives during the World War.

Drew, Daniel (1797-1879), American capitalist, was born in Carmel, Putnam co., N. Y. Through fortunate investments he became exceedingly wealthy, his fortune at one time being estimated at \$15,000,000. He was a generous patron of the Methodist Episcopal Church; he founded the Drew Ladies' Seminary at Carmel, N. Y., and the Drew Theological Seminary at Madison, N. J.

Drew, John (1853-1927), American actor, son of John Drew (Irish-American actor, 1825-62) and Louisa Lane Drew, was born in Philadelphia. He was educated at the Episcopal Academy in that city, and made his first appearance on the stage as a member of his mother's stock company, in the character of Plumper in *Cool as a Cucumber* at the Arch Street Theatre in 1874. The following year he joined Augustin Daly's stock company in New York, in which he became leading man in 1879. He played with Ada Rehan in a notable series of Shakespearean revivals, making a particular success as Petruchio in *The Taming of the Shrew*, and was long a favorite leading juvenile of New York audiences. After 1892 he acted throughout the country as a star under Charles Frohman's management. His later presentations include *The Masked Ball* and *The Tyranny of Tears*. In 1905 Mr. Drew succeeded Joseph Jefferson as president of The Players, founded by Edwin Booth.

Drew, Louisa Lane (1820-97), American

actress, was born (Lane) in London, England, and was brought to America while a child. She first appeared on the stage as the young Duke of York at the Walnut Street Theatre in Philadelphia in 1829. She was leading lady at the Walnut Street Theatre from 1838 to 1840, and played as a star and in stock companies in the principal cities of the Union until 1861, when she undertook the management of the Arch Street Theatre in Philadelphia, remaining in charge over thirty years. Among her best known characters were Beatrice, Mrs. Malaprop, and the Widow Cheseley. She was thrice married, the last time to the elder John Drew. Her children, John Drew, Sidney Drew, and Georgiana (Drew) Barrymore, all attained distinction on the stage.

Drewry's, or **Drury's Bluff**, a locality on the James River, Va., about 8 m. south of Richmond. Fortifications were erected there by the Confederates early in the Civil War, and on May 15, 1862, an unsuccessful attack was made on these defences by five Federal war vessels, including the *Monitor*. On May 13-16, 1864, the position was attacked by Gen. B. F. Butler. He was finally repulsed by the Confederates under Gen. Beauregard, who forced Butler to retire to Bermuda Hundred, where, to use Grant's phrase, he was 'bottled up' by Beauregard.

Drew University, an institution of the Methodist Episcopal Church, at Madison, New Jersey, founded as Drew Theological School in 1866 by gift of Daniel Drew, and incorporated in 1868. In 1928 its name was changed to Drew University.

Drexel, Anthony Joseph (1826-93), American banker, was born in Philadelphia. He was first associated with the firm of Drexel & Co. (founded by his father) in Philadelphia in 1839 and eventually became its head. He was a generous patron of the arts and of music, and established the Drexel Institute of Arts, Sciences, and Industry in Philadelphia.

Drexel Institute, an educational institution in Philadelphia founded in 1891 through the generosity of Anthony Drexel. It is a coeducational technical college with day, evening, and extension sessions, and a summer school.

Dreyfus Affair. In the autumn of 1894 Captain Alfred Dreyfus (born at Mülhausen in Alsace, 1859), an officer of the French army, while studying at the staff college in Paris, was arrested on a charge of offering to sell military secrets to a foreign power, un-

derstood to be Germany. He was tried by court-martial on December 19-22, the prosecution relying upon a single document, unsigned and undated—the *bordereau*, a schedule of the papers offered for sale. Experts were not unanimous as to this being in Dreyfus' handwriting; but his personal unpopularity, combined with strong anti-Semitic feeling (the accused being of Jewish birth), turned the scale, and Dreyfus was condemned to military degradation and imprisonment for life. In January, 1895, he was sent to imprisonment on the Ile du Diable, off the coast of French Guiana.

An agitation now began for revision of sentence. On January 13, 1898, Zola, the novelist, published an open letter 'J'accuse,' in *L'Aurore*, addressed to the president of the Republic, and protesting the innocence of Dreyfus. Finally, on Sept. 27, 1898, the Dreyfus verdict was at last referred to the Cour de Cassation, and in consequence of its decision—after an inquiry into the facts as well as the law, it ordered a fresh trial—Dreyfus was brought home, and the case retried at Rennes (Aug. 7 to Sept. 9, 1899).

The new trial was marked by the most contemptible evasions and most damaging admissions of the military witnesses, and ended, not by a reversal of the original sentence, but by a sentence of guilty and a condemnation to ten years' imprisonment. But on Sept. 19, 1899, the unfortunate officer was pardoned by the president of the Republic and liberated the next day.

The case was once more referred to the Cour de Cassation early in 1904. On July 12, 1906, the court gave a decision annulling the verdict of 1899, declaring, in effect, that no guilt attached to Dreyfus. On July 13 bills were passed reinstating Dreyfus in the army with the rank of Major. During the World War, Dreyfus was promoted lieutenant-colonel, and in 1919 received the cross of the Legion of Honor. He died 1935.

Drift, in geology, a term that has been generally adopted to include all the Quaternary (Pleistocene, Glacial, and Recent) sands, gravels, and clays of glacial, interglacial, and post-glacial formation. As it implies that the materials have been carried from a distance, it is properly restricted to the accumulations of the Glacial period; but many geologists regard all surface deposits as 'drift,' even though they have formed *in situ*.

Drift Maps, maps designed to show underlying rock conditions. The knowledge of the

superficial geology of an area obtained from a drift map gives an approximate estimate of the value of the soils.

Drill (*Cynocephalus leucophæus*), a West African baboon closely allied to the mandrill, from which it differs chiefly in the absence of the brilliant coloring which makes the face of the mandrill so hideous.

Drill, a name given along the northeastern coast of the United States to several small gasteropod molluscs, especially *Urosalpinx*, which bore through the shells of oysters and clams in order to get the flesh and juices of these molluscs, and thus do great damage to beds of cultivated oysters.

Drill (Military and Naval). In its general application this term refers to the various systems of exercises and instructions by which the several units of any organization are brought up to a state of efficiency and maintained in this condition. See also GUNNERY; STRATEGY AND TACTICS; DRILL REGULATIONS.

Drill Regulations, textbooks of military exercises for each branch of the service, describing in detail the commands and manner of execution for all authorized movements, as well as the handling, care and preservation of all material pertaining to the particular branch. Consult *Drill Regulations* of the various branches of the U. S. Army; also article TACTICS.

Drills and Drilling. The operation of boring or drilling cylindrical holes through strongly resisting material is performed by two distinct classes of tools—metal drills and rock drills.

Metal drills have a removable steel cutting-head, or 'bit,' which is driven with a rotary motion, and at the same time pressed steadily on the object to be perforated. High speed steel is now being used for drill-heads and admits of a rate of speed several times as great as was formerly possible.

Rock drills have a chisel-shaped cutting-head, which is driven with a rapid, reciprocating motion. A quick succession of sharp blows is thus delivered, the drill being automatically rotated through a fraction of a revolution between each stroke, so as to obtain a boring of circular section. The most portable and generally useful type of rock drill is driven by compressed air, and is attached to a heavy tripod stand, placed over or in front of the site of the required hole. (See PNEUMATIC TOOLS.) An exceptional pattern, fitted for deep and exploratory boring, is the diamond drill.

Drinkwater, John (1882-1937), British poet and playwright, was born in Leytonstone, Essex. He became manager and producer of the Pilgrim Players, later known as the Birmingham Repertory Company. In 1908 he published his first volume of verse and in 1911, his first play *Cophetua*. His other publications include *Critical Studies of William Morris* (1912); *Swinburne* (1913); *Abraham Lincoln* (1918), a play which met with a warm reception in the United States; *Loyalties* (1919); poems, *Mary Stuart* (1921); *Oliver Cromwell* (1921); *Preludes* (1922); *Robert E. Lee* (1923); *The Gentle Art of Theatre Going* (1927); *Bird in Hand* (1927).

Droeshout, Martin (fl. 1620-51), English engraver, member of a Flemish family that had settled in England. He was chiefly an engraver of title-pages and of portraits and is remembered particularly for his engraved portrait of Shakespeare, prefixed to the first (1623) folio edition of the poet's works. This engraving is almost certainly a copy of what there is good reason to believe is the only portrait of Shakespeare made during the poet's lifetime.

Drôme, department, France, of which the Rhone forms the western boundary; area, 2,532 sq. m. The broad valley of the Rhone is fertile and produces mulberries, chestnuts, walnuts, and vines. Silkworm rearing is the leading industry. Valence is the capital; p. 263,509.

Dromedary, a word sometimes used for certain strains of the camel, or for the one-humped camel (*Camelus dromedarius*) generally. Correctly used it should be reserved for the riding camels of this species, as contrasted with the baggage camels. See CAMEL.

Drone. See Bees.

Dropsy, a collection of serous fluid in the cellular tissues or in a body cavity. Dropsy is a general term: 'ascites' is dropsy in the abdominal cavity, 'hydrocephalus' is fluid within the cranium, and 'hydropericardium' is the collection of serous fluid within the pericardial cavity about the heart. Dropsy is caused by a weakening of the propelling power of the heart, or by obstruction to the blood or lymph current, or by a weakening of the vessel walls, so that serum passes through them at a greater rate than that at which it can be absorbed. It is also caused by changes in the constitution of the blood, and by lessening, through disease, of the absorbent powers of the membrane lining serous cavities.

Droseraceæ, an order of plants, mostly perennial bog-plants, with five-petalled flowers. The most important genus is *Drosera*, composed of a number of species of insectivorous plants known as **SUNDEWS**. The grass of Parnassus (*Parnassia palustris*) *Drosophyllum* and *Dionæa* also belong to this order.

Drouet, Louis François Philippe (1792-1873), French musician, was born in Amsterdam, Holland. He became solo flutist to the king of Holland, and afterward to Napoleon. He visited the United States in 1855 and lived for a time in New York City.

Drought, a meteorological term applied to periods of more than fourteen consecutive days without measurable rain (absolute droughts), and to periods of more than twenty-eight consecutive days wherein the aggregate rainfall does not exceed one-hundredth of an inch per diem (partial droughts). Some parts of the globe suffer from almost perpetual drought.

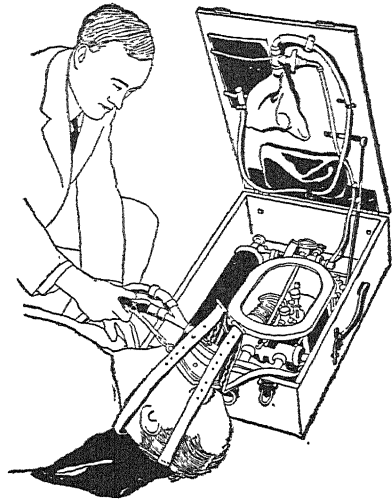
The year 1933-1934 saw the worst drought so far on record. From June 1933 through May 1934 only five states could report precipitation normal or above. In nine states, all but one of the Middle West, there was more than 50% deficiency. July and the August following saw spectacular damage to feed crops and wheat. July was the hottest month in the records of the weather bureau; suffering of cattle and of human beings was intense. The loss was not only in crops; dust storms caused damage in soil deficiency; residents of the Atlantic seaboard found topsoil from the Dakotas blown east as fine dust to irritate their eyes and noses. Congress appropriated \$525,000,000 for drought relief. In addition emergency feed loans from the Farm Credit Administration and money received from sale of cattle to the Government were aids accorded the farmer in the large drought areas who had no feed crops at all for their remaining cattle.

Drouyn de Lhuys, Edouard (1805-81), French statesman, was born in Paris. Becoming minister of foreign affairs in the Odillon-Barrot administration under Prince Louis Napoleon (1848), he directed French policy during that eventful time.

Drown, Thomas Messinger (1842-1904), American metallurgist and educator, was born in Philadelphia. He was president of Lehigh University.

Drowning, death by immersion of the whole or a part of the body, in any fluid. The more usual resuscitation methods are taught in First Aid and Life-Saving classes.

Hall's method has the advantage of being possible for one man to adopt alone. It consists, after stripping the patient, wrapping him in dry coverings, and clearing his mouth, in laying him flat, and rolling him alternately onto his face and his back, thus alternately expressing the air from the lungs and allowing it to re-enter. It forms the basis of all the methods.



Resuscitation from Drowning.

In the Schaefer method, which is perhaps the simplest and most used at present, the procedure is as follows: the operator first straddles the body by kneeling a little above the victim's knees, he then places the hands with thumbs close to the forefingers, on the small of the victim's back immediately above the hip bones, with the finger tips out of sight. He makes the arms rigid and throws the weight of his body forward with a steady pressure and as this is done he squeezes in with the fingers, thus forcing in the floating ribs. While making this downward pressure he counts deliberately—one—two—then snaps the hands off the body onto the ground, continuing to count—three—four—five—, and resumes the movement as before; this is carried on until resuscitation is achieved. The entire movement takes about five seconds, about twelve movements to the minute. It is conceded that no pains should be spared to restore life for at least an hour after the heart and lungs have apparently ceased to act. If there is no medical man to decide

these points, there should be no slackening of perseverance for *two* hours.

Drowning was at one time a legal method of execution in Great Britain, particularly for women. It survived in Scotland until 1685, and in Switzerland until 1652. The water-test was also a common method of ascertaining the guilt or innocence of supposed witches. If the wretched victim floated, she was held to be a witch; if she sank, she was innocent. Consult Fisher's *A Manual of Artificial Respiration* (1923).

Druce Case arose because the 5th duke of Portland (1800-79), a man of retired habits, was thought to have led a double life, and was alleged to be the same person as T. C. Druce, a prosperous upholsterer of Baker Street, London, who was supposed to have died in 1804. In order to contest the Portland title and estates, Mrs. Druce, widow of the son of the above Druce, brought a law suit on behalf of her son, and, declaring that the funeral of T. C. Druce was a mock one, demanded that the grave should be opened (1897). This request was refused. Proceedings in the law courts followed. When an American witness named Caldwell came forward and declared that he had been present at a mock burial (1907), the grave was opened. All doubts were set at rest when the body of T. C. Druce was found in his coffin.

Drugget, a woolen fabric or felt, the heavier kinds of which are used as a border for carpet squares, for covering carpets, and sometimes even in place of a carpet.

Drug Habits. The most important habit-forming drugs are certain narcotics, such as opium and its derivatives, morphine, codeine, and heroin; cocaine; and certain hypnotics, such as antipyrine, antifebrine, medinal, sulphonal, trional, veronal, etc., which are derived from coal tar. The practice of taking drugs without medical prescription has unfortunately grown very prevalent in recent years; and as these drugs are readily obtained in convenient tabloid form, an increasing number of persons each year fall victims to the serious and often fatal habit of self-medication. Toleration for very large doses is arrived at by degrees.

Among the women of Constantinople, drug addiction is said to be so common as to be almost a matter of fashion; and presents are made of syringes, with silver and jewelled cases, so that reciprocal injections of morphine can be made. The morphine habit is said to have been widely prevalent in Paris

also, but to have considerably declined in recent years.

Introduction to the seductive influences of these drugs can frequently be traced to their administration by a medical practitioner for the relief of pain, melancholia, or insomnia. A great responsibility, therefore, rests with physicians who have recourse to morphine, cocaine, alcohol, etc., as therapeutic agents.

In the case of *morphine* and *cocaine* the diagnosis, or rather the detection, of the habit is not always easy in cases in which the practice is concealed or unsuspected. No reliance whatever can be placed on the patient's statements, as he acquires by dint of the habit the power of vigorous and sustained deception, with at times considerable ingenuity. Heroin, barbituric acid derivatives, the sulphonal group of hypnotics, hashish, chloral, ether, and chloroform have all been observed to form habits causing mental and moral deterioration, usually progressive. But the overwhelmingly powerful influence of opium and its derivatives morphine and heroin, and cocaine and substances coming from it, best exemplify the dangers of drug addiction. The Opium Committee of the League of Nations has been active in efforts to control the trade in opium. (See OPIUM.)

In the United States, a Federal law, known as the Harrison Anti-Narcotic Act, became effective on March 1, 1915. This law regulates and limits the inter-State traffic in harmful drugs. In New York State a drastic measure, known as the Boylan law, regulating the sale of opium, chloral, cocaine, and heroin, went into effect on April 14, 1914. It prohibits their sale except on the prescription of duly licensed persons, and provides for registration of prescriptions. For hospitals and care of drug victims in New York, see NEW YORK CITY.

Drugs, any animal, vegetable, or mineral substance used medicinally for internal administration. See PHARMACOPEIA; PATENT MEDICINES; PURE FOOD AND DRUG LAW.

Druids, a caste of priests among the Gauls and other Celts of Western Europe. Britain was at one time the chief school for Continental aspirants to Druidism. Human sacrifice formed one of the leading features of their quinquennial festivals. Cæsar thus describes the character and functions of the Druids:

'The Druids take no part in warfare; nor do they pay taxes like the rest of the people, they are exempt from military service, and

from all public burdens. Attracted by such rewards, many come to be instructed by their own choice, while others are sent by their parents. They are reported to learn in the school a great number of verses, so that some remain there twenty years. Beyond all things, they are desirous to inspire a belief that men's souls do not perish, but transmit after death from one individual to another; and they hold that people are thereby most strongly urged to bravery, as the fear of death is thus destroyed. Besides, they hold a great many discourses about the stars and their motion, about the size of the world and of various countries, about the nature of things, about the power and might of the immortal gods; and they instruct the youths in these subjects.

The Druids held the oak and the mistletoe as sacred, and cut the latter with a golden sickle, the officiating priest being robed in white and crowned with a chaplet of oak leaves. The term Druid was applied also by the Celts to the wizards and magicians of the native races. Their dwellings, according to some traditions, were the rude bee-hive huts, such as those called 'Druids' houses' in St. Kilda and Boreray.

Druids, United Ancient Order of, a secret order for fraternal and benevolent purposes, founded in England in 1781, in America in 1839, and in Germany in 1872. Its rites and ceremonies are based on the history and traditions of the ancient Druids and its general form of government is similar to that of the Odd Fellows.

Drum of the Ear. See **Ear**.

Drum, a percussion instrument, of Eastern origin, formed of a hollow cylinder of wood or metal, over one or both ends of which a parchment skin is stretched—the snare or side drum and bass drum; also a hollow, semi-globular vessel, usually made of brass or copper, and having a skin stretched over its mouth—the kettle-drum.

The snare drum or side drum is essentially a military instrument, though sometimes used also in orchestras. This drum is tightened by means of hoops over the heads, laced with an endless cord passing zigzagwise from head to head, and braced with leather braces, or with rods and screws. Across the lower end several catgut cords, or snares, are tightly stretched in contact with the skin, causing a rattle when the other end is beaten. When anything is put between these snares and the skin to prevent the rattle, the drum is said to be *muffled*, and is so used at funerals. The

roll for the side drum consists in striking two blows alternately with each stick. The side drum was formerly used as a signal instrument, and the *drummer* is still an army institution; but as a rule, the bugle now does the signalling.

The bass drum is of similar construction, having two heads, played with a stick having a soft round knob, the centre of the head being struck. The kettle-drum is the only member of the family which can claim to be a musical instrument. Two and sometimes three of these drums are used in the orchestra, and two in cavalry bands.

Drumfish, or **Drum**, a name applied to several fish of the family *Sciaenidae*, especially to the large Salt Water Drum (*Pogonias chromis*), which frequents the inshore waters of the Atlantic Coast, where its steady drumming is often heard beneath anchored boats at night. Molluscs form the main part of its foods, and it destroys great numbers of oysters, especially in the beds about New York.

Drumlins, irregular rounded or oval mounds of boulder clay, sometimes from a hundred to two hundred ft. high and many hundred yards in length, but usually much smaller. They are abundant in most flat countries over which an ice sheet has passed—for example, in Central Wisconsin and North-western New York. They seem to be due to irregular currents in the vast mass of ice which was slowly moving forward over the country.

Drum-Major, the non-commissioned officer who has charge of a drum corps. In the U. S. Army he ranks as a first sergeant. He is appointed by the regimental commander on the recommendation of a regimental adjutant; preference is usually given to tall and well-built men.

Drummer. See **Commercial Traveller**.

Drummond, Sir Gordon (1772-1854), British soldier, was born in Quebec. During the War of 1812 he commanded at the Battle of Lundy's Lane (1814); and after the war was commander-in-chief of the British forces in Canada until 1816.

Drummond, Henry (1851-97), Scottish scientist and evangelist, lecturer (1877), and professor (1884) of natural science in the Free Church College, Glasgow. In 1879, 1887, and 1893 he visited the United States, where he lectured on religious, scientific, and sociological subjects, and took part in scientific expeditions to the Rocky Mountains.

Drummond, Thomas (1797-1840), Irish administrator, was born in Edinburgh. His

fame as a scientist rests on his adaptation of the limelight—the 'Drummond light'—and on his improved heliostat for turning rays of light in a given direction. He began his career as an Irish administrator as under-secretary at Dublin Castle (1835-40).

Drummond, William, of Hawthornden (1585-1649), Scottish poet. He first appeared as a writer in an elegy on the death of Prince Henry (1613), son of James I. He corresponded from 1618 to 1631 with Drayton, and in 1619 entertained Ben Jonson. Consult Masson's *Life*.

Drummond, William Henry (1854-1907), Canadian physician and poet, was born in County Leitrim, Ireland, and removed to Canada when a boy. He was graduated from Bishop's Medical College, Lennoxville, Quebec (1884), where he was later professor of medical jurisprudence. In 1888 he settled in Montreal, and practised there until his death. His publications include: *The Habitant, and Other French Canadian Poems* (1897); *Johnnie Courteau, and Other Poems* (1901); *The Voyageur, and Other Poems* (1905); *The Great Fight* (posthumously, 1908).

Drunkenness. See INTOXICATION; ALCOHOLISM; DIPSOMANIA; TEMPERANCE; DIVORCE.

Drunkenness in Law. Legally, drunkenness is defined as the lack of mental coherence and self-control produced in a person by drinking intoxicating liquors to excess. While a single act of intoxication is properly described as drunkenness, the term drunkard or inebriate is usually reserved for those who become addicted to the habit of drinking intoxicating liquors to excess. Drunkenness is not a crime at common law, nor is it today a statutory offence unless accompanied by brawling, or unless exhibited in a public place. Under the latter circumstances it is a matter for police regulation in the interests of public order and decency, and is punishable by fine or imprisonment.

Drupe, a fruit which does not open wide when ripe, and which has the three layers of the ovary (pericarp, mesocarp, and endocarp) distinct, the endocarp being hard and constituting the stone. The plum and cherry are examples of drupes in which the mesocarp is succulent; in the cocoanut it is dry; and in the walnut, tough. The individual grains of the raspberry, blackberry, etc., are called drupelets. See FRUIT.

Drury, Dru (1725-1803), English naturalist. His fame as an entomologist rests on his

collections of insects—one of which contained 11,000 specimens—acquired by unremitting efforts extended over a period of thirty years.

Drury Lane Theatre. The first regular theatre in Drury Lane, London, was built about 1616, and was called the Phoenix. At the Restoration, Sir William Killigrew erected a new theatre in Drury Lane, which was opened to the public in 1663, and which was destroyed by fire in 1672. A third theatre was designed by Sir Christopher Wren, and was opened in 1674. Quin, Macklin, Olive, Pritchard, and Garrick insured the popularity of the house after 1726. In 1819 Edmund Kean took London by storm, and restored vitality to Drury Lane. In recent years the Drury Lane has been chiefly devoted to pantomimes, melodramatic and spectacular pieces.

Druses, a mysterious people, remarkable for their distinctive religious belief, inhabiting the mountainous regions of Lebanon, Anti-Lebanon, and Hauran in Syria, and generally considered to have sprung from a mixture of Eastern tribes in which the Arab element is conspicuous. Hakem Biamrillah, the sixth Fatimite calif (996-1021 A.D.), was the author of their peculiar religious system.

The doctrine of the Druses is a mixture of Mohammedanism, Judaism, Christianity, Greek philosophy, and Persian mysticism. They hold that there have been ten incarnations of the Deity, the last being Hakem, to whose second coming, as the messiah, the faithful look forward.

In 1588 the Druses, until then an independent nation, were made tributary to Turkey by Murad (Amurath) III.; but in the beginning of the 17th century they temporarily regained self-government under Emir Fakhred-din. A long-standing feud between the Druses and the Maronites culminated in 1860, when extensive massacres of the Christians led to the intervention of the French and British governments. During and following the World War the Druses entered into agreements with the French, who have continued to hold the mandate over Syria. In 1925 there were Druse uprisings of a serious nature against the French, involving fighting around Damascus; but in 1927 peace was finally established. Disturbances have since arisen between the Druses and the neighboring peoples. They are estimated to number in all about 80,000, of whom 50,000 dwell in Hauran, and 15,000 on the slopes of Lebanon. The manufacture of silk is the principal industry, carried on chiefly at Shimlan. Consult C. H. Churchill's *The Druses and*

Maronites under Turkish Rule; Lord Carnarvon's *Recollection of the Druses of the Lebanon*; Robert Browning's poem, *The Return of the Druses*; Ewing's *Arab and Druse at Home*.

Drusilla, (1) **Livia**, wife of the Roman Emperor Augustus, and mother of the Emperor Tiberius. See **LIVIA**. (2) Daughter of Herod Agrippa I., king of the Jews, and wife of Felix, the procurator of Judæa. She was present with her husband when St. Paul preached before him in A.D. 60.

Drusus, a distinguished Roman family of the Livian clan. The most famous were the following:

(1) **MARCUS LIVIUS DRUSUS** was tribune of the people along with Gaius Gracchus in 122 B.C., consul in 111 B.C.

(2) **NERO CLAUDIUS DRUSUS**, commonly called 'Drusus Senior,' was the son of Tiberius Claudius Nero and Livia, and younger brother of the Emperor Tiberius. He was born in 38 B.C. He was employed in high military commands by Augustus, especially in Germany, where in four campaigns, from 12 to 9 B.C., he conquered the Rhæti, and extended the frontier of the Empire to the Elbe. He married Antonia, the daughter of Mark Antony; was the father of Germanicus and the Emperor Claudius; and died 9 B.C.

Dryads, nymphs who were associated by the ancient Greeks with the trees and woods.

Dryburgh Abbey, a beautiful ruined Premonstratensian abbey in Berwickshire, Scotland. It contains the dust of Sir Walter Scott and his son-in-law and biographer Lockhart. The abbey is said to have been founded in 1150 by David I. Edward II. burned it in 1322, and Robert the Bruce partly restored it.

Dryden, John (1631-1700), English poet, was born at Aldwinkle, All Saints, Northamptonshire. He entered Westminster School at the age of twelve, and Trinity College, Cambridge, at nineteen. He received his bachelor's degree in 1654, but seems to have remained at Cambridge until 1657. He had several London residences, the best known of which was in Gerrard Street, Soho, a house which is now marked with a tablet.

Dryden's first work of value was his *Heroic Stanzas to the Memory of Oliver, Late Lord Protector*, composed in 1659. This was followed by a number of panegyrical poems, culminating in *Annus Mirabilis* (1667).

In the meantime, the poet had produced the first of his dramatic works, *The Wild Gallant* (1663), *Rival Ladies* (1663) and *The Indian Emperor* (published in 1667), the last a tragedy entirely in rhyme, and the earliest

regular example of the 'heroic play.' Between these and *Love Triumphant* (1694), the last of his plays, he produced numerous other dramas, the most important of which are: *The Conquest of Granada* (1670); *Marriage à la Mode* (1672); *Aurungzebe* (1675); *All for Love* (1677); *The Spanish Friar* (1681); and *Don Sebastian* (1689). Of these, *All for Love*, a tragedy in blank verse, is generally con-



John Dryden.

sidered the best, though at the time none was more popular than *The Spanish Friar*, a violent attack on the Roman Catholics and Anti-Exclusionists.

In 1670 Dryden was made poet laureate and historiographer royal. The disturbances in public opinion that followed the Popish Plot provoked his splendid series of satires, beginning with *Absalom and Achitophel*, published anonymously in 1681. The casting of a medal by the Whigs on the rejection of the bill of treason against Shaftesbury was the subject of a second satire, *The Medal* (1681). This called forth many replies, one by Thomas Shadwell, whom Dryden, passing from political to literary satire, attacked in *MacFlecknoe* (1682) and the second part of *Absalom and Achitophel* (1682).

Almost simultaneously with this last satire, Dryden published *Religio Laici*, a defence of

the Church of England, in which he exhibits to the full his masterly power of reasoning in verse. Following the accession of James II., however, he went over to the Roman Catholic Church, and in *The Hind and the Panther* (1687) denounced Protestantism and defended his newly adopted faith. *Juvenal* and *Persius* both appeared in 1693, *Virgil* in 1697, and *Fables*, including renderings of Homer and Ovid and paraphrases of Chaucer and Boccaccio, in 1700.

Among Dryden's other works may be mentioned the *Essay on Dramatic Poesy* (1668), which established his position as a critic, and the two odes, *Song for St. Cecilia's Day* (1687) and *Alexander's Feast* (1697). In poetry he marks the establishment of the classical school; in prose the change to the more supple and practical modern style; while his greatness in literary theory and appreciation has won for him the title of 'Father of English criticism.'

Dryden's plays appeared in two folio volumes in the year of his death, and were afterward re-edited by his friend Congreve, in six duodecimos. All previous editions were superseded by that of Sir Walter Scott (1808), re-edited in 1883-9 by Saintsbury, with additions and corrections. Scott's *Life* is excellent, and is the standard. The editions of Bell, Mitford, and Christie are useful. Consult also Garnett's *Age of Dryden*; Saintsbury's *Dryden* ('English Men of Letters Series'), and *English Criticism* (1911); *Cambridge History of English Literature* (vol. VIII., 1912); Mark Van Doren's *Poetry of John Dryden* (1920); T. S. Eliot's *John Dryden* (1932).

Dryden, John Fairfield (1839-1911), American financier and public official, was born near Farmington, Me., and was educated at Yale. He entered the life insurance business, and after making a special study of its industrial and economic aspects, founded the Widows' and Orphans' Friendly Society, in Newark, N. J., in 1873. This developed into the Prudential Insurance Company of America, of which Dryden was secretary from 1875 to 1881, and president from 1881 until his death. He was U. S. Senator from New Jersey (1902-07).

Dry Docks. See **Docks.**

Dry Farming, as practised in the United States, may be defined as the profitable production of useful crops without irrigation on lands that receive a comparatively small annual rainfall—as, for instance, 20 inches or less; for it is not possible to draw a sharp

line between dry and humid farming. Historically, its practice is very old, for it can be traced back to early peoples, notably those who lived in Northern Africa; and among the Chinese, Hindus, Mexicans, and even the aboriginal American Indians, there are evidences of its employment. In a way, however, the principles of dry farming may be credited to Jethro Tull (1674-1741), an English agriculturist, who more than two hundred years ago announced that thorough tillage was of value in conserving moisture and enabling plants to reach maturity with the least amount of water. The great arid regions of the Western United States, which were for a time ignored, have in recent years attracted the attention of experts in agriculture, resulting in the practice of dry farming. Its modern use may be said to have begun in Utah in the early sixties of the last century, and from there it extended into California, as well as to other adjacent States.

Essentially, success in dry farming is dependent on two important factors: first, the climatic conditions; secondly, a thorough knowledge of the soil.

Since 1906 the U. S. Department of Agriculture, with its corps of experts, has studied the effect of cultural methods upon crop products in the Great Plains area, which covers about 400,000 sq. m. in Montana, North Dakota, South Dakota, Nebraska, Kansas, Wyoming, Colorado, New Mexico, Oklahoma, and Texas. The crops under investigation included spring wheat, winter wheat, oats, barley, corn, milo, and kafir corn, and the methods of soil preparation included fall ploughing, spring ploughing, discing corn stubble, green manuring, summer tillage, and listing for small grain, corn, milo, and kafir.

The results showed that when climatic conditions are favorable, with an annual precipitation of from 15 to 21 inches, profitable crops can be produced by any one of the several cultural methods now in common use; but without favorable climatic conditions no profitable crops can be produced.

Annual dry farming congresses have been held at various places in the Western United States since 1907, and several of the arid or semi-arid States have organized State dry farming conventions. The reports of these bodies are among the most valuable publications dealing with this phase of agriculture. The literature on the subject is abundant, and includes many special papers issued by the U. S. Department of Agriculture.

Drying Machines, a term applied particu-

larly to machines employed in laundries and textile factories for drying fabrics which have been bleached, dyed, or otherwise wet. As the output of any drying machine depends on the amount of water to be extracted, goods are usually submitted to a preliminary drying process, either by passing them between a pair of squeezing bowls or grooved rollers, mounted in a stationary frame and subject to strong pressure, or by the use of a centrifugal drying machine, or hydro-extractor.

For drying long webs of cotton cloth, a machine consisting of a series of metal cylinders revolving in an iron frame, and heated internally with steam, is employed. Certain fabrics, however, are injured by direct contact with heated metal; and these are dried by passing them over a series of wooden guide rollers, through a hot-air chamber or 'hot flue.'

In paper manufacture, drying apparatus is employed similar to that used in the textile industries, consisting of heated cylinders over which the paper is passed. Mechanical drying devices employed in other industries include drying pans and troughs in the manufacture of salt, pigments, and sugar; drying kilns in cement works, brickmaking and pottery manufacture; drying cylinders in brick, cement, tile and pottery works, as well as for shale, sand, crushed quartz, phosphates, many kinds of ores and minerals, fertilizers, sugar, salt, soda, cocoa, coffee, filter-pressed grains, etc.; and drying tunnels, similar to the cabinets used in laundries, for woolen and other yarns, bricks, and clay wear.

Dryophis, or **Whipsnake**, a genus of snakes, comprising eight species, found in Southeastern Asia and Malaysia, and mostly arboreal in habit. They are remarkable for their slender, elongated bodies, and for a curious prolongation of the snout, which in some is slender and in some leaf like.

Dry Point, a sharp etching needle, used to incise fine lines in copper, without the plate being covered with etching ground, or the lines bit in by acid (see **ENGRAVING**; **ETCHING**). The work produced by the dry point is not only very delicate, but it wears less in printing than lines produced by the action of acid.

Dry Rot, a decay of timber caused by the growth of various fungi, the *mycelium* of which penetrates the substance of the timber, destroying its texture, and reducing it to a fragile or friable mass. *Merulius lachry-*

mans and *Polyporus destructor* are species productive of this mischief; the first being by far the most common and formidable.

Of the causes of dry rot, stagnation of air, as behind a wainscot or under a floor, is one of the chief; another cause is insufficient drying of the timber itself. For the prevention of dry rot, various processes have been employed, of which the most effective is creosoting.

Dry Tortugas, a group of ten islets in the Gulf of Mexico, forming part of Monroe co., Florida. They are of coral formation, and are partly covered with mangrove bushes. Fort Jefferson, used as a prison during and after the Civil War, is located on one of the islands. On another, Loggerhead Key, are a light of the first order and a marine biological laboratory, established in 1904 by the Carnegie Institution of Washington. The Dry Tortugas group is a Federal bird reservation.

D.Sc., Doctor of Science.

Dual Alliance. See **Alliance**.

Dualism, a term used in philosophy to describe any theory which rests on two ultimate principles of explanation so divergent as to appear incapable of being reduced to any unity. It may safely be said that in general the appearance of dualism in any system or theory is exaggerated by criticism, and that the assertion of duality, however extreme, rarely excludes in the minds of the authors or adherents of the system the supposition of some unity beneath or beyond it. See **MONISM**; **MATERIALISM**; **IDEALISM**; **REALISM**.

Dual Monarchy. See **Austria-Hungary**.

Duane, James (1733-97), American lawyer and public official, was born in New York City. In 1765 he established a settlement at Duanesburg, N. Y., and attained prominence in the legal profession. He became a member of the first Continental Congress in 1774, and of the convention that drafted the first constitution of New York State (1776); of the Committee of Safety in New York City (1776-7); of the State senate (1782-5); and after the British evacuation, served as mayor of New York City (1784-9). In 1788 he was a member of the convention that adopted the Federal Constitution, and from 1789 to 1794 was U. S. district judge for New York.

Duane, William (1760-1835), American journalist, was born near Lake Champlain, N. Y. In 1795 he came to Philadelphia, edited *The Aurora*, which became very influential in Democratic circles, and practically secured the election of Jefferson as President. He

published: *The Mississippi Question* (1803); *A Military Dictionary* (1810); *A Visit to Colombia in 1822-3* (1826), etc.

Du Barry, Marie Jeanne Aimart (de Vaubernier), Comtesse (1746-93), was born in Vaucouleurs, France; daughter of a dressmaker whose final husband, an excise-man, gave the child his name. In 1769 Comte Jean Du Barry, to advance himself, got Louis xv.'s valet to bring her before the King. The latter was fascinated by her gay, free-mannered charm; he had Jean's brother William marry her, and she was presented at Versailles by and as a lady of quality. The chief minister, Duc de Choiseul, was cashiered for objecting to her; in 1771 the Parliaments were abolished by her means; the highest courted her favor; the state's money was lavished on her. She was snubbed by the royal family; and to escape Versailles she had the King build her *Luciennes*. On Louis xv.'s death Louis xvi. placed Mme. Du Barry in a convent, where she won esteem; then gave her back *Luciennes*, with a pension. She beautified it, and patronized arts and literature, though without knowledge or taste. During the Reign of Terror (1793) she went to England to sell her jewels for her royal protectors, and on her return was sent to the guillotine by Robespierre for conspiracy and wearing mourning on their account. Her published *Lettres* are fictions, and the *Mémoires* by Lacroix *et al.* uncritical gossip.

Dublin, maritime county, Leinster province, Ireland. It forms part of the central limestone plain of Ireland, except where its hills rise toward the granite highlands of Wicklow, on the s. Agriculture and fishing are the most important industries. Area, 342 sq. m., or, including the city of Dublin, 354 sq. m.; p. including metropolis, 476,909.

Dublin, the former capital of Ireland, now the capital city of the Irish Free State, is located in the county and on the bay of the same name. Part of the city is built on land reclaimed from the sea, and the ground is generally flat. The city is traversed e. and w. by the River Liffey, which divides it into two almost equal portions. The fashionable quarters occupy the northeastern and southeastern sections; the principal shops and middle-class residences occupy the centre and n.w. sections; and in the s.w. section, where were situated the ancient 'Liberties' of St. Patrick's, is now the slum district.

Among the features of Dublin are its broad streets and numerous squares. The most imposing street is Sackville, 120 ft. broad, with

the Rotunda at its northern end. The city is surrounded by a Circular Road of nearly 9 m. in length, a favorite drive and promenade. In buildings erected for the international exhibition of 1865 was housed the Royal University of Ireland until its dissolution under the Irish Universities Act (1908), which provided for a new university at Dublin, under the title of the National University of Ireland. Trinity College is the oldest educational institution. The Catholic University, a Jesuit institution, was founded in 1854.

St. Patrick's Cathedral (Protestant), founded in 1190, and restored by Sir B. L. Guinness in 1865, has been surrounded by Lord Iveagh with public gardens. Christchurch Cathedral (Protestant), founded in 1038, was restored by Henry Roe in 1878.

At Ball's Bridge, south, are the extensive grounds and buildings of the Royal Dublin Society, where shows of cattle and horses are held. The chief manufactures of Dublin are porter, stout, whiskey, and poplin.

The earliest history of Dublin is legendary. Historically, the Danes occupied it till Strongbow, in 1171, made it permanently English. In 1207 the city received a new charter from King John. In the Irish wars of the Commonwealth it was held in turn by both sides.

Since 1689 Dublin, as the capital of Ireland, has continued to be the centre of Irish history. In 1853 the first great industrial exhibition was held here. During the Fenian rebellion of 1867, the Habeas Corpus Act was suspended, and 960 arrests were made in Dublin in a few hours. On July 26, 1914, a riot took place, following an attempt by the police to seize a consignment of rifles landed in the harbor for the National Volunteers (see IRELAND).

On April 24, 1916, the first shots of the so-called Sinn Féin Rebellion were fired in Dublin; and the Post Office, Four Courts, and other public buildings fell into the hands of the rebels. An Irish republic was declared next day, with Padriac H. Pearse as president, and James Connolly as vice-president and commandant of troops. On April 29, President Pearse and the other leaders surrendered to the British government. They were immediately tried by a military court; some were executed, while others were imprisoned for life or for shorter terms. On Aug. 3, Sir Roger Casement, accused of enlisting the support of the German government in aid of the insurgents, was executed on a charge of high treason.

Dublin, University of, the leading insti-

tution for higher learning in Ireland. The first University of Dublin was established in connection with St. Patrick's Cathedral in 1320. The present University, commonly known as TRINITY COLLEGE, was founded near Dublin by Queen Elizabeth in 1591. The oldest existing building dates from a grant of William III. (1698), the library from 1712, the University press from 1726. The tercentenary was celebrated on an elaborate scale in July, 1892.

Degrees are conferred in arts, divinity, law, medicine, music, and engineering. The University is now open to women on the same terms as men. The library is entitled to a copy of every book published in the United Kingdom, and includes nearly 400,000 volumes. Many distinguished men are counted among the alumni of the University, including Archbishop Ussher, Burke, Sheridan, Swift, Goldsmith, Berkeley, and Sir W. Hamilton.

Dubois, city, Pennsylvania, Clearfield co. Bituminous coal mining is extensively carried on. The chief industries are blast furnaces, machine shops, railway repair shops, glass and clay works, lumber and planing mills, and foundries; p 12,059.

Du Bois, Augustus Jay (1849-1915), American engineer, was professor of civil and mechanical engineering at Lehigh University (1874-6), and professor of mechanical engineering (1877-84) and of civil engineering (1884-1915) at the Sheffield Scientific School.

Dubois, Clément François Théodore (1837-1924), French organist and musical composer. In addition to his sacred and orchestral works, he has composed the oratorios *Les Sept Paroles du Christ* (1867); the ballet *Farandole* (1883); the dramatic idyll *Xavière* (1895).

Dubois, Guillaume (1656-1723), French cardinal and statesman. In 1687 he was chosen tutor of the young Duke of Chartres. When the Duke became regent of France (1715) he appointed him Prime Minister. From 1715 until his death Dubois was one of the most prominent statesmen in Europe.

Dubois, Paul (1829-1905), French sculptor and painter. His statue of the *Chanteur Florentin*, exhibited in 1865, now in the Luxembourg at Paris, and his equestrian statues of *Jeanne d'Arc* (1895), at Rheims, and *Le Connétable de Montmorency*, at Chantilly, are his masterpieces. Dubois also excelled as a portrait painter, the finest example of his art in this genre being *Mes Enfants*, exhibited in 1876.

Du Bois, William Edward Burghardt (1868-), American writer, was born in Great Barrington, Mass., of Negro descent. In 1896 he became professor of economics and history at Atlanta University; and in 1910 director of publications of the National Association for the Advancement of Colored People and editor of *The Crisis*. In 1934 he returned to Atlanta U. He published. *The Souls of Black Folk* (1903), *John Brown* (1909); *Quest of the Silver Fleece* (1911); *The Negro* (1915); *Darkwater* (1920); *Black Reconstruction* (1934); *Dusk of Dawn* (1940).

Dubufe, Edouard (1820-83), French portrait painter. Notable portraits by him are those of Dumas fils, Emile Augier, Philippe Rousseau, the Empress Eugénie, Rosa Bonheur, the Princess Mathilde, and the Marquise de Galliffet. His paintings, *The Peace Congress of 1856 at Paris* and *The Prodigal Son*, are in the Versailles Gallery.

Dubuque, city, Iowa, county seat of Dubuque co. It is the western terminus of the Illinois Great Highway from Chicago, and a number of Wisconsin and Iowa primary roads pass through the city. Dubuque occupies an advantageous site on the bluffs on the western bank of the river, which is here crossed by three bridges. Dubuque is the business center of an important agricultural region, and carries on an extensive trade. The chief industries are sash and door factories, flour and lumber mills, railroad repair shops, iron and brass foundries, boiler works, ship yards, and the manufacture of phonographs, clothing, and shoes. Settled in 1833, and chartered as a city in 1840, Dubuque is the oldest city of the State. Its site was formerly occupied by a trading and mining camp of French-Canadians established by Julien Dubuque in 1788; p. 43,892.

Du Cange, Charles Dufresne (1610-88), French historian, one of the greatest scholars of the seventeenth century, was born in Amiens. His favorite studies were classical philology and history. He wrote a large number of learned works, including *Glossary of Latin Words Used in the Dark and Middle Ages* (*Glossarium ad Scriptores Mediæ et Infimæ Latinitatis*) (1678), a work which has proved of invaluable service to scholars. He also issued the companion work *Glossarium ad Scriptores Mediæ et Infimæ Græcitatatis* (1688).

Ducat, a coin formerly in extensive use in Europe. It was in use during the Middle Ages, and continued in circulation till the nineteenth century.

Duccio di Buoninsegna (?1260-?1318), Italian painter, founder of the Siennese school, and one of the foremost painters of mediæval Italy, was born in Siena. In his power of composition, his knowledge of perspective, and his grouping and illuminative faculties, he is rivalled among his contemporaries and followers by Giotto only. His most important altar piece, *The Virgin and Child Enthroned*, with, at the back, the *Life of Christ*, in twenty-seven scenes (Cathedral Museum, Siena), was completed in 1310.

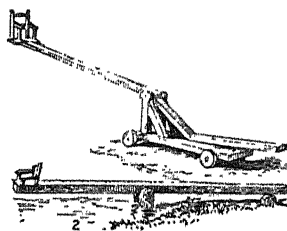
Ducey, Thomas James (1843-1909), American clergyman, was born in Lismore, Ireland. After serving at the Church of the Nativity and St. Michael's, New York City, he founded St. Leo's Church in 1880, and was its pastor for nearly thirty years. He inherited a large amount of money, which he spent in furthering religious and philanthropic activities. He was a merciless opponent of the Tweed Ring, and a staunch defender of Father McGlynn; and he was one of the founders of the People's Municipal League and the Social Reform Club.

Du Chaillu, Paul Belloni (1835-1903), African explorer and author, was born in New Orleans, La., and was educated in Paris, France. In 1855, under the auspices of the Academy of Natural Sciences of Philadelphia, he went on an exploring expedition to Africa, where he remained for four years. His book excited much controversy, some scientific critics affirming many of his statements to be fabulous, while others, such as Professor Owen and Sir Roderick Murchison, supported them. The traveler's credit for accuracy was established by later explorers. In 1863 Du Chaillu left on a second expedition to Africa, where he remained for two years, and described this expedition in *A Journey to Ashango Land* (1867). In 1872-3 he made a tour in Northern Europe, which he described in *The Land of the Midnight Sun* (1881), one of the most popular of his works. He also wrote for the young: *Stories of the Gorrilla Country* (1868); *Wild Life Under the Equator* (1869); *Lost in the Jungle* (1869); *My Apingi Kingdom* (1870); *The Country of the Dwarfs* (1871).

Duck, any member of the family Anatidæ, in the order Anseres or goose-like birds. The prominent characteristics of the family are the short webbed feet, with a small hind toe; the netted scales in front of the lower leg; the bill, about as long as the head, rounded at the tip, and bearing the nostrils toward the broad root. They are characteristically

aquatic birds, swimming with much agility, diving comparatively little. Great flocks are often seen in migratory flight to and from their northern homes. The most important genus is *Anas*, which includes the common wild duck (*A. boschas*), with its domesticated form (*A. domestica*), and numerous other species. The *mallard* or *wild duck* occurs in North America as far s. as Florida and the West Indies, and is widely distributed from Great Britain to Japan.

Much training, skill, and sagacity are needed to achieve success in hunting wild duck. In the United States and Canada, large guns and heavy charges are used, and in most places the aid of retrievers is required to recover dead or wounded birds. In most cases the hunter cautiously stalks the birds, or waits concealed among reeds or bushes where they may be expected to pass during their migratory flights, or floats within range in a small boat. But the best results and most exciting experiences are gained by selecting a place on the marshy shore of some sea inlet or inland lake in the early dawn, and anchoring in the offing wooden images of ducks at a proper distance from the fowler's position. The flying wild ducks will 'pitch down' toward these decoys, which appear to them to be feeding undisturbed. The shooters may conceal themselves in a small hut or 'blind,' built of rushes or the like, or in a similarly hidden pit, or, on snowy shores, in an ice hut; or they may lie hidden among the marsh grasses in a shallow little boat or 'sneak box,' colored and disguised according to the surroundings. The laws of most States tend to uniformity in prohibiting the molestation of wild duck during the breeding season.



Specimens of Ducking Stool.

1, Leominster; 2, Broadwater.

Ducking Stool, a chair fixed at the end of a movable beam, in which shrewish offenders were in England, and in some of the American colonies, bound and ducked in water as a punishment.

Duckweed, the most important member of the family Lemnaceæ, which includes a number of minute aquatic flowering plants, a favorite food of water fowl.

Ducommun, Elie (1833-1906), Swiss peace advocate, was born in Geneva. He was chancellor of the canton of Geneva. In 1891 he was commissioned by the Congress of Rome to organize the International Bureau of Peace at Berne; and in 1902 he was awarded one-half of the Nobel Peace Prize for that year.

Ductility is that property of solids in virtue of which they can be drawn out so as to increase their length at the expense of their cross dimensions. As a rule, the ordinary metals are all more or less ductile; some, such as iron, copper, platinum, gold, and especially silver, being eminently so. Glass is ductile when in a semi-molten state.

Ductless Glands. See **Glands**.

Duddell, William Du Bois (1872-1917), English engineer. In 1908 he was secretary of the International Conference on Electrical Units and Standards. He is the inventor of the Duddell Arc Light, used in Wireless Telegraphy.

Dudevant, Madame. See **Sand, George**.

Dudley, Joseph (1647-1720), American colonial governor, was born in Roxbury, Mass. He was one of the commissioners for the United Colonies (1681); and was subsequently appointed president of New England, and chief justice of the Superior Court. In 1690 he was made chief justice of New York, and from 1693 to 1701 was in England, where he became a member of Parliament. He returned to be captain-general and governor-in-chief of Massachusetts Bay (1702).

Dudley, Paul (1675-1751), American jurist, son of Joseph Dudley, was attorney-general of Massachusetts. He was a naturalist of repute. He left a bequest to Harvard for the purpose of establishing an annual lecture in defence of Christianity (Dudleian Lecture).

Dudley, Plimmon Henry (1843-1924), American inventor, born Freedom, O. He invented the dynagraph, track indicator, and stremmatograph; introduced the first five-inch steel rails used in the United States; and in 1916 discovered a process for rendering steel rails unbreakable.

Dudley, Thomas (1576-1653), American colonial governor. As a leading member of the Massachusetts company he settled in Boston (1630), and became deputy governor

along with his son-in-law, Simon Bradstreet. Between 1634 and 1650 he was four times governor of Massachusetts. He was one of the founders of Harvard (1636).

Duel, a single combat following on a challenge, and fought with deadly weapons according to the regulations of an unwritten 'code of honor.' These are commonly enforced by witnesses called seconds, who are present at the time and place appointed. The private duel was not known in England until the beginning of the sixteenth century. It was introduced from France, where the custom arose early in the fifteenth century. In France over two thousand gentlemen are said to have lost their lives in duels during the reign of Henry IV. The practice, once introduced into England, spread rapidly over the British Isles. Noblemen and gentlemen of fashion, members of Parliament, lawyers, doctors, clergymen, and even ladies, appealed to this mode of satisfying wounded honor. The first reported duel in America occurred at Plymouth, Mass., in 1681; the most noteworthy was that between Alexander Hamilton and Aaron Burr in 1804, resulting in the death of the former. General Washington discouraged the practice. Legally, in both the United States and England, a duel is regarded as a criminal offense, and the sending of a challenge as a breach of the peace. See **ASSAULT**; **HOMICIDE**; **MURDER**.

Duenna (Spanish, from Latin *domina*, 'a lady') is literally a married lady, and is used specifically as the chief lady-in-waiting of the queen of Spain. In common parlance it signifies any elderly lady who has charge over young girls.

Duer, William Alexander (1780-1858), American jurist. In 1822-9 he was a judge of the N. Y. State supreme court, and in 1830-42 president of Columbia College.

Duet, a musical composition for either two voices or two instruments, or for two performers on one instrument.

Duff, Mary Ann (1795-1857), American actress, played with Edmund Kean in leading Shakespearean rôles, winning a high reputation as a tragedienne.

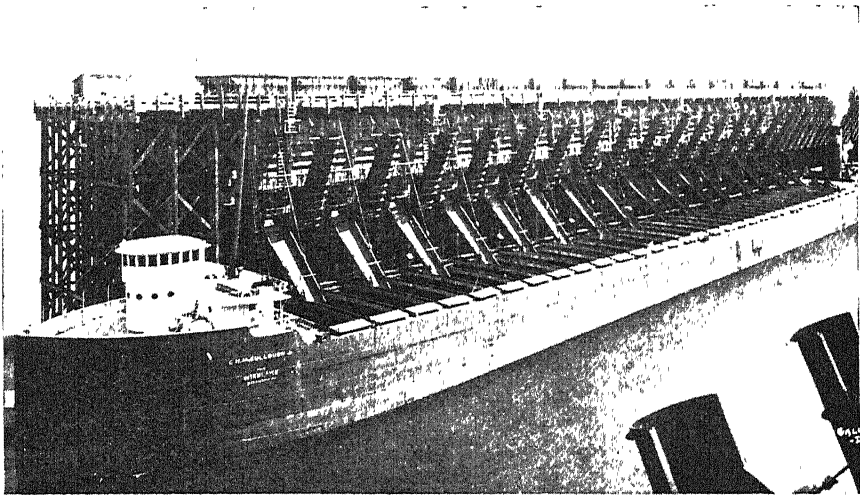
Duffy, Sir Charles Gavan (1816-1903), Irish Nationalist and Australian statesman. He founded the *Nation* at Dublin (1842), and to its columns contributed the papers afterward republished as *Ballad Poetry of Ireland*, a work which ran through forty editions in as many years. He was one of the promoters of the Tenant League and Independent Irish Party; but on the disruption of

the latter (1855) he resigned his seat in Parliament, and emigrated to Australia. There he became minister of public works (1857), prime minister of Victoria (1871-72), and speaker of the Legislative Assembly (1877). He published *Young Ireland: a Fragment of Irish History 1810-50* (1880), and *Four Years of Irish History 1845-49* (1883).

Dugong, a marine mammal belonging to the order Sirenia and the genus *Halicore*, found on the shores of the Indian Ocean from East Africa to Australia, and around the Red Sea. It is similar in habits to the manatee but never ascends rivers. Dugong fishing is a regular industry in Australia. The

bacco, and cotton factories and shipyards; p. 424,070.

Dukas, Paul (1865-1935), French composer and critic, was born in Paris. He won the second Prix de Rome in 1888, and in 1909 became professor at the Conservatory. His works include the overtures *King Lear* (1883), *Goetz von Berlichingen* (1884), and *Polyeucte* (1891); a symphony (1896), in C Major, in three movements; a villanelle for horn; the famous ballet *La Peri* (1910); the symphonic poem *L'Apprenti Sorcier* (1897), after Goethe's *Zauberlehrling*; one three-act opera, *Ariadne et Barbe Bleue* (1907, Paris) with text by Maeterlinck, and a lyrical drama



Duluth: Steamer loading Iron Ore.

clear oil obtained has excellent medicinal value, and the flesh is of good quality and flavor.

Duikerbok ('diver'), Dutch name for the small African antelopes belonging to the genus *Cephalophus*, in allusion to the rapidity with which the animals dive into the thick bushes for protection.

Duisburg-Hamborn, municipal borough, Germany, in the Rhine Province. In 1905 the former Duisburg united with Ruhrort and Meiderich in one community and in 1929 with Hamborn. Their combined harbors form one of the largest inland harbors in Europe. Features of interest are the Salvator-Kirche (15th century Gothic); the Rathaus; and a memorial fountain to Mercator. There are large iron works, machinery, chemical, to-

L'Arbre de science. Piano works are *Sonata E flat*; *Variations*, *Interlude and Finale* (on theme of Rameau); and *Prélude élégiaque*. In 1932 he became president of the Union Syndicale des Compositeurs. By deep study of the important schools, Dukas laid scholarly foundations upon which he built in the best French impressionistic style.

Duke, a title originally given to the leader of a military expedition (dux), and later to military governors of provinces. In England the title was probably introduced by William the Conqueror, Duke of Normandy. Since the days of Edward III, kings have conferred dukedoms on members of their families and on their favorites.

Duke University, in Durham, North Carolina, was founded by James B. Duke in

1924. It includes Trinity College, dating from 1835, when Union Institute was founded in Randolph County by the Methodists and Friends. It became Trinity College in 1859 and was moved to Durham in 1892. The Woman's College is the undergraduate college for women, which in 1930 was set apart. Also included are the Graduate School of Arts and Sciences, School of Religion, School of Law, School of Nursing and the Duke Forest. Between 1924 and 1932 the faculty was more than doubled and the student body trebled.

Dukhobors (Spirit Wrestlers), a Russian sect founded at Kharkov about 1740. Their resistance to authority led to their removal in 1837 to Transcaucasia. In 1898 they were allowed to migrate to Canada. They number nearly 10,000 and are frugal, honest, sober and industrious.

Dulcimer, a stringed instrument known to the Persians and Arabs, and still found in Hungarian bands, where it is called *czimbalom*. It is played with two small wooden hammers, and is said to have suggested the idea of the pianoforte.

Du Lhut, or **Duluth**, **Daniel Greysolon** (?-1709), Franco-American explorer, was born in Lyons, France, of noble descent, and under Frontenac became a leader among the Canadian *couvreurs de bois*. He built a trading post on Lake Superior, the site of the present Fort William, and in 1678-80 was engaged in exploring the reaches of the Upper Mississippi. He was active in the Indian wars and rendered great service to the French colony. The city of Duluth is named in his honor.

Dulse, the name commonly applied to two species of edible sea-weed (*Rhodomenia palmata* and *Iridaea edulis*) which are largely distributed over the coasts of Northern Europe and the Grecian Archipelago. In Iceland, dulse is stored to be eaten with fish; it is dried and eaten raw or cooked in Scotland and Ireland.

Duluth, city, Minnesota, county seat of St. Louis co., and third city of the State. It is situated at the w. end of Lake Superior at the mouth of the St. Louis River. The city is well built and has many substantial buildings. There are five parks, aggregating 750 acres, and 25 miles of boulevards, one of which, Lakeview Terrace, traverses an old beach line of Lake Superior, 400 to 500 ft. above the present level of the lake. In a position of unexampled advantage at the head of navigation on the Great Lakes and as a shipping

point for an enormous wheat region to the West, as well as for the great iron ore region of Minnesota, Duluth has grown at an extraordinary rate. The principal articles of shipment are lumber, wheat, flour, wool, hides, and iron, silver, and copper. There are large slaughtering and cold storage establishments, also stockyards, flour mills, blast furnaces, rolling mills, steam forge works, carbide works, and many manufacturing establishments. Duluth was settled in 1853. It takes its name from Sieur Du Lhut; p. 101,065.

Duma, the term used for representative assemblies in the principal Russian cities, or more popularly, for the council of state, popularly known as the 'Russian parliament.' This body was created by an imperial ukase of August 19, 1905, which provided for the selection, on a restricted franchise and by means of a complicated electoral machinery, of a representative assembly to act in an advisory capacity to the emperor in the work



Alexandre Dumas (Père).

From the painting by Vieusseux.

of legislation. Popular discontent, manifesting itself primarily in a great general strike that for a time completely paralyzed the industrial life of the nation, extorted from the tsar the manifesto of Oct. 30, 1905, which promised

the extension of the suffrage to all classes, and ordained that no law should be valid without the consent of the Duma, whose constitution was determined by law, March, 1906. The first Duma assembled in the Tauride Palace, St. Petersburg, on May 10, 1906, and was dissolved by the emperor on July 22, because the socialist majority wished to take a hand in the actual government; the second, which assembled March 5, 1907, was similarly dissolved.

In order to prevent another socialist majority the czar, before the election of the third Duma, promulgated a new electoral law (June 16, 1907) which insured a majority of the privileged class of the nobility and gentry. This was in direct violation of the Constitution but on Nov. 14, 1907, the third Duma assembled. It carried out no legislation which was not desired by the government. It did, on the other hand, provide a place where free political discussion might take place. The fourth Duma, elected in 1912, was of the same character and remained in session until March 11, 1917. On this date its formal existence came to an end by the prorogation of the body on the very day of the first Revolution of 1917.

Dumas, Alexandre, generally known as Dumas père (1802-70), French novelist and dramatist, was born in Villers-Cotterets, department of the Aisne, the grandson of Count Alexandre Davy de la Pailleterie and Marie-Cessette Dumas, a Haytian negress, and the son of Alexandre Davy-Dumas and Marie Labouret, a tavern-keeper's daughter. A perusal of L'Estoile's *Memoirs* inspired in him the idea of his great Valois cycle of novels. He wrote his play, *Henri III.*, in two months; and on Sept. 17, 1828, the committee of the Théâtre Français accepted it 'by acclamation.' By his request the Duc d'Orléans went to the play, with all the guests who had dined at his house. The piece was instantly successful. A new romantic art had arisen. That art was born from the works of Shakespeare, Scott, Schiller, and Goethe. It was not in durable poetry that Dumas shone, like Gautier, Victor Hugo, and De Musset. He had, on the other hand, the genius of popularity. Historic legend, rather than actual history, supplied his themes, which he treated as people liked to see them handled—vigorously, rapidly, with abundance of humor, and quite enough of 'French fury.'

Then came the Days of July, which overthrew the Bourbons. In the revolution, not only did Dumas wear his shooting dress and

carry his gun in civic combat, but in an exploit more or less heroic he seized a store of gunpowder at Soissons, and brought it to the revolutionary party. He was assured that 'this was the noblest of his dramas.' Louis Philippe seated himself on the throne, but had a quarrel with Dumas on a point of etiquette and costume. The first novel of real mark, *Le Chevalier d'Harmental*, is of 1843, and the famous romances were poured out like a flood till 1850. Dumas cared for style no more than Scott did. It sufficed him to be lucid and spirited.

The controversy as to plagiarism and unacknowledged collaboration is tedious and unessential. What is immortally delightful in Dumas—the wit, the glorious spirits, the brilliance, the swagger, the movement, and the genial morality, the ingenious narrative—is all his own. The three books of the D'Artagnan cycle—*The Three Musketeers* (1844), *Twenty Years After* (1845), and *The Vicomte de Bragelonne* (1848)—with the three of the Valois cycle (1844), are alone enough for a splendid and lasting reputation. His *Œuvres Complètes*, including *Monte Cristo*, *Les Mémoires d'un Médecin*, *Les Quarante-Cinq*, *Olympe de Clèves*, and *Ange Pitou*, most of which have been translated into English, were published in 277 volumes in 1860-84. See Davidson's *A. Dumas Père, his Life and Work* (1902); and Gorman's *The Incredible Marquis* (1929).

Dumas, Alexandre (1824-95), French dramatist, illegitimate son of Alexandre Dumas père, whence he is often called A. Dumas fils, was born in Paris. After publishing a volume of verse, *Péchés de Jeunesse*, in 1847, he made a striking success in the following year with his novel *La Dame aux Camélias*. He adapted it and its successor, *Diane de Lys* (1851), for the stage; the plays were produced in 1852 and 1853 respectively, were enthusiastically received, and have enjoyed a long popularity. From that time, though he wrote other novels, he gave his best work to the drama. *Le Demi-Monde* (1855), which is a 'comedy of manners,' and *La Question d'Argent* (1857), which is a Stock Exchange play, were followed by *Le Fils Naturel* (1858) and *Un Père Prodigue* (1859), the first of which in many ways reflects his own and the second his father's life. These were the beginning of a series of dramas dealing with questions of the day, as they appeared to his somewhat restricted vision.

With all his serious enthusiasm for his theories, his outlook upon life was too biased

to make his philosophy of much account. Among his plays are *La Princesse Georges* (1871); *Denise* (1885); *Francillon* (1887). See Claretie's *Alexandre Dumas, Fils* (1883); P. Bourget's *Essais de Psychologie Contemporaine* (1886); Doumic's *Portraits d'Écrivains: A. Dumas, Fils* (1897); and Matthews's *French Dramatists* (1901).

Dumas, Jean Baptiste André (1800-84), French chemist and senator, born at Alais (dep. Gard). He acquired a wide reputation by his researches on isomerism, the law of substitutions, the atomic weights of elements, and other chemical problems. Among his numerous works are *Traité de Chimie Appliquée aux Arts* (1828-46), and *Leçons sur la Philosophie Chimique* (1837). To Dumas France is indebted for the organization of an excellent system of instruction in agriculture, and the institution of a European sanitary congress.

Du Maurier, George Louis Palmella Busson (1834-96), English artist in black and white and novelist. He illustrated Thackeray's *Esmond* (1868) and *Ballads* (1878), Jerrold's *Story of a Feather*, and other works. In 1892 he published his first novel, *Peter Ibbetson*, partly based on early recollections, in *Harper's Magazine*; and in January, 1894, in the same magazine, appeared the first chapter of *Trilby*, which achieved a marvelous success. Du Maurier is remembered for his pictorial satires of English social life which appeared in *Punch*.

Dumbarton, co. tn., seapt., Scotland, 16 m. n.w. of Glasgow. Dumbarton Castle, a fortress at least a thousand years old, and one of the four still maintained at the public expense, according to the terms of the union of 1707, is situated on an isolated, double peaked basaltic rock rising 200 ft. above the river. The shipbuilding yards are among the most important on the Clyde; p. 21,989.

Dumbarton Oaks Conference. See UNITED STATES, UNITED NATIONS CONFERENCES.

Dumbartonshire, co. in the w. of Scotland, bounded on the s. by the Clyde, and e. by Stirling and Loch Lomond. In scenery it is unequalled in Scotland, owing to its numerous lochs, glens, and heights. The largest lakes are Loch Lomond, 'the queen of Scottish lakes' (24 by 5 m.), with thirty islets, Loch Long and the Gare Loch forming the peninsula of Roseneath, where the Duke of Argyll has a seat. Amongst the chief industries are Turkey-red dyeing, calico-printing, chemical manufactures, coal-mining, and shipbuilding.

There are salmon and herring fisheries. Bruce died at Cardross. The shire has also associations with Rob Roy, Smollett, and Henry Bell; p. 139,831.

Dumb-bells, iron weights consisting of a handle with an oblate sphere at both ends. One is grasped in each hand, and swung for exercise. In modern figurative speech, a dull witted person.

Dumb Cane (*Dieffenbachia seguine*), a W. Indian plant about six ft. in height, cultivated in Britain as a stove plant. In its native land those who chew this plant occasionally become dumb in consequence.

Dumbness, or the absence of articulate speech, may be temporary or permanent, and may be congenital or acquired. If congenital, it is generally the result of deafness, which prevents the acquisition of speech by imitation. A child who has learned to speak may become dumb if he loses hearing as late as his fourth, fifth, or even sixth year. Dumb children who suffer from partial or complete deafness are taught to communicate by the signs known as the 'deaf and dumb alphabet,' or may learn to speak by the so-called 'lip-reading.' (See DEAFNESS.) Dumbness in adults may follow upon apoplexy, or from the pressure of a tumor on the brain, preventing thought or speech, or cutting off communication between brain and tongue, though both may be uninjured. Dumbness is also caused in some cases by hysteria. Aphasia is a neurotic disorder of or impediment to speech.

Dum-Dum, or **Dam-Dama**, tn., Paraganas dist., Bengal, India. It is a military station, and has a factory for the manufacture of small-arms ammunition, whence the name of the 'dum-dum bullet'; p. 20,820.

Dumfries, river port, and cap. of Dumfriesshire, Scotland. Robert Burns was buried in St. Michael's Churchyard, and a mausoleum was erected to his memory in 1815. A fine marble statue of the poet was unveiled in 1882. In Greyfriars' Church John Comyn was stabbed by Robert the Bruce in 1306; p. 16,062.

Dumfriesshire, border co. in the s. of Scotland. The surface on the whole is bare and undulating. In the n. and n.e. it is mountainous. Near Lochmaben is Castle Loch, and on the n. frontier is dark Loch Skene, the source of the romantic 'Grey Mare's Tail'; p. 75,370.

Dümichen, Johannes (1833-94), German Egyptologist, born near Glogau in Silesia. He wrote numerous works on Egyptian history and archæology, one of the best known

being *The Fleet of an Egyptian Queen* (1868).

Dummer, Jeremiah (1680-1739), American public man, born in Boston. He removed to England, where he was later of valuable assistance to the Massachusetts Colony as London agent (1709-21). He wrote *Defence of the New England Charters* (1728).

Dummer's War, the name (from William Dummer, acting governor of Mass. in 1723-28) by which the hostilities (1721-25) between the settlers in Maine, then part of Mass., and of what is now Vermont, and the Abenaki Indians and their allies is sometimes known. See Parkman, *A Half Century of Conflict* (1892).

Dumont, Pierre Etienne Louis (1759-1829), Swiss social philosopher. He conceived a great admiration for Mirabeau, reminiscences of whom he embodied in his *Souvenirs sur Mirabeau* (post. 1832). But he was more profoundly influenced by Bentham, to whose service he largely devoted himself, both as literary assistant and apologist. The result of his labors appeared in the *Traité de Législation civile et pénale* (1802; 2d ed. 1820); *Traité des Preuves judiciaires* (1823); and other works.

Dumont d'Urville, Jules Sébastien César (1790-1842), French navigator and botanist, was a native of Normandy. Sent (1826) to obtain tidings of La Pérouse, he discovered that he had been wrecked on one of the Solomon Islands. The results of the expedition, rich in natural history, were published in fifteen volumes, under the title *Voyage de la Corvette d'Astrolabe* (1830-4). His next voyage was to the Antarctic, described in *Voyage au Pôle Sud et dans l'Océanie* (24 vols., 1841-54). See *Life*, in French, by D'Aurgle (1890).

Dumouriez, Charles François (1739-1823), French general and statesman, born at Cambrai. When the allied troops began to threaten France, Dumouriez was appointed to the command of the army of the north. The victory of Valmy (1792) was due to his splendid strategy, as also the second victory of Jemappes and the successful campaign in the Austrian Netherlands which followed. At last, however, he was severely defeated by the Austrians at Neerwinden (1793).

Dunbar, Paul Laurence (1872-1906), Amer. poet, the son of a former Kentucky slave, and of pure African blood, was born in Dayton, O. He published his first volume, *Oak and Ivy* (1893). His third volume of verse, *Lyrics of Lowly Life* (1896), called

general attention to his work and received commendation from Mr. W. D. Howells and Mr. James Lane Allen. Mr. Dunbar was appointed to a position in the library of Congress in 1897.

Dunbar, William (?1465-1530?), chief of the old Scottish poets or 'makaris,' was born in Lothian. He accompanied several of the embassies sent to England and the Continent. There is no record of his life after the death of James IV. at Flodden in 1513, but he is supposed to have died about 1530. Dunbar is justly regarded not only as the greatest of the old Scottish 'makaris,' but as the greatest British poet between Chaucer and Spenser. Both as man and poet he had much in common with his only Scottish poetic rival in greatness, Robert Burns, with, however, this striking difference, that none of his verse is inspired by the passion of love. The collected editions of his *Poems* are those of Laing (1824; 2d ed. 1865), of the Scottish Text Society (1884-93), and of Professor Schipper (1892-3). See also Schipper's *William Dunbar, sein Leben und seine Gedichte* (1884); and *William Dunbar*, by Oliphant Smeaton, Famous Scots Series (1898).

Duncan, Isadora (1878-1927), American interpretive dancer, born in San Francisco, made her debut as a dancer in New York at fifteen, but lived most of her life in Europe. Her two children, whose father she never named, were drowned when their automobile rolled into the Seine at Paris. At the invitation of Lenin she went to Russia to teach dancing and there married the Russian poet, Serge Yessenin, who committed suicide a year later. Miss Duncan was killed at Nice, France, in 1927 when her scarf, tangling in the wheel of her automobile, choked her.

Duncan, Thomas (1807-45), Scottish painter, born at Kinclaven, Perthshire. His chief pictures illustrate Scottish history.

Dunciad, The, the most celebrated of English satires, published in 1728 by Alexander Pope, in which, under the figure of a description of the reign of Dulness, the author's literary opponents are held up to ridicule.

Duncker, Maximilian Wolfgang (1811-86), German historian. His reputation is based on his historical works, chiefly *Geschichte des Allertums* (1878-83).

Dundee, city and seaport, Forfar, Scotland, is the third largest city of Scotland. The staple industries are the manufacture of jute, marmalade, flax, canvas sails, sacks, ropes, and sheeting. Its preserve manufactures are noted, while shipbuilding, dyeing,

brewing, and distilling are also carried on. It was one of the first places in Scotland to espouse the doctrines of the Reformation, and in it Wishart preached during his last mission to Scotland (1544-6); p. 165,006.

Dundee, John Graham, of Claverhouse, First Viscount (?1649-89), Scottish soldier, was born in Forfarshire. In 1682 he suppressed the Covenanters of Dumfries, Annandale, and Kirkcudbright, and then those of Ayr and Lanark; indeed, he was the main agent in enforcing the more summary measures during the 'killing time.' As second in command of the Scottish forces, he marched s., in October, 1688, to oppose the threatened invasion of the Prince of Orange, and on November 12 he was at Salisbury created Viscount Dundee and Lord Graham of Claverhouse. After James II.'s flight to France, Dundee organized a rising in the Highlands, which resulted (July 17, 1689) in his death at Killiecrankie.

Dundonald, Douglas Mackinnon Bailie Hamilton Cochrane, Twelfth Earl of (1852), British soldier, served in the Nile expedition (1884-5), distinguishing himself at Abu Klea. In 1902 he was appointed to the command of the British forces in Canada, but was recalled by the Secretary of State for War. See CANADA.

Dune. A dune is a wavelike mound or ridge the materials which have been accumulated and shaped by the wind. Dunes may occur wherever sand is formed—by the margins of seas, lakes, and rivers; in inland regions of low rainfall, which are by far the most extensive dune-covered areas. A dune has a gentler windward and a steeper leeward slope. It tends to move from windward to leeward, for the rolling grains fall over into and lie in the relatively calm lee hollow in which the skipping grains also come to rest. Dune movements of 70 ft. per annum are recorded. Dunes may rise to 600 ft. above the general level (N. African coast). Desert dunes are fundamentally crescent-shaped, and from 60 to 300 ft. high, and other forms are derived from combinations or modifications of them. See Walther's *Das Gesetz der Wiutenbildung* (1900); Schirmer's *Le Sahara* (1893); Sven Hedin, in *Petermann's Mitteil.*, Ergänzt. No. 131 (1900); Cornish, in *Geog. Jour.*, March, 1897, June, 1899, January, 1900; Chamberlin and Salisbury's *Geology I* (1905).

Dunedin, cap. of prov., Otago, New Zealand, at the head of a lake-like harbor 13 m. long; p. 85,000.

Dunes, Battle of the, a victory obtained by Turenne over the Spaniards under Don John of Austria and Condé on the dunes at Dunkirk, June 14, 1658.

Dunfermline, town, Fifeshire, Scotland, 3 m. n. of the Forth. Prior to the union it was a favorite residence of Scottish kings, several of whom, including Bruce, are buried in its abbey. Pittencrieff Glen (now the property of the Carnegie Trust for Dunfermline, munificently endowed by Mr. Andrew Carnegie, a native of the town) contains Malcolm Canmore's ruined tower and the royal palace, the scene of the ballad of *Sir Patrick Spens*. The abbey, founded in 1072, was burnt by Edward I., but restored by Bruce. The town is the center of the damask linen trade of the United Kingdom; p. 47,000.

Dungans. See **Zungaria**.

Dung-beetle (*Geotrupes stercorarius*), a handsome European beetle, with fine metallic tints, which may be seen flying about in autumn evenings. It is one of the lamellicorn beetles of the family Scarabidae, and feeds on dung, and in it lays its eggs.

Dungeness, low headland, England, at extreme s. of Kent.

Dunkards, Dunkers, or **Tunkers**, a sect of German Baptists who originated in Germany about 1708, the founder being one Alexander Mack. But almost immediately they were compelled to seek refuge in Holland, and from there they emigrated to the United States, settling near Philadelphia (1719-29), and have since spread over the country. Their creed is evangelical, and they administer baptism by immersion. There are three branches (or four, if the Seventh Day Baptist, German, be counted) named the Conservative, Progressive, and Old Order, differing principally upon the degree of conformity to social customs, habits of dress and of worship.

Dunkard Series. The strata forming the topmost Paleozoic in the Appalachian region is known as the Dunkard Series. They are limestones and sandstones with a number of thin coal seams.

Dunkirk, or **Dunkerque**, fortified town, and important seaport, France, in the department of Nord, on the Strait of Dover. During the first World War Dunkirk was repeatedly shelled and bombed from air, land, and sea. May 29, 1940, the British troops trapped in France began to be evacuated through Dunkirk under heavy air attack.

Dunkirk, city and port of entry, New York,

Chautauqua co., on Lake Erie. Dunkirk is the center of a rich grape-growing region, and there are quarries and mineral springs in the vicinity. The harbor has been greatly improved by the national government, and the city is one of the largest freshwater fishing ports in America; p. 17,606.

Dunlap, William (1766-1839), American dramatist, author, and painter, was born in Perth Amboy, N. J. His comedy, *The Father*, was successfully produced in New York in 1789. He was a founder and vice-president of the National Academy of Design. His books include *Life of George Frederick Cooke* (1813); *History of the Rise and Progress of the Art of Design in the United States* (1834).

Dunlin, or **Ox-bird** (*Tringa alpina*, or *Pelidna*), a sandpiper, found at all seasons on flat shores, or on the banks of tidal rivers throughout all northern countries. The North American form is known as the Redbacked Sandpiper (*T. alpina sakhalina*), and is seen in the United States only in winter, as it breeds in the Arctic regions.

Dunlop, John Colin (d. 1842), Scottish writer, whose fame rests on his *History of Fiction* (1814), still the standard work on the subject.

Dunmore, John Murray, Earl of (1732-1809), colonial governor of New York in 1770-71, and of Virginia, 1771-75, was born in England.

Dunmore's War, the war of 1774 between the white settlers of Virginia (of which John Murray, Earl of Dunmore, was then governor) and the Cherokee, Shawnee, and other Indians. The war is sometimes known also as Cresap's War (see LOGAN).

Dunne, Finley Peter (1867-1936), American journalist and humorist, was born in Chicago, Ill. In 1900 he went to New York, and in 1906 became associate editor of the *American Magazine*. His 'Mr. Dooley' (the prototype of whom was a Chicago saloon-keeper) first became popular in the newspapers by his philosophical criticism of the Spanish-American War. Dunne's sketches include *Mr. Dooley in Peace and War* (1898); *Mr. Dooley in the Hearts of his Countrymen* (1898); *Mr. Dooley Says* (1910).

Dunnet Head, a promontory in Caithness, in the n. of Scotland, forming the most northerly point of Great Britain.

Dunois, Jean (1402-68), French soldier, known as 'Dunois the Brave,' and the 'Bastard of Orleans,' was the natural son of Louis, Duke of Orleans, born in Paris. In 1428 he

held Orleans until the arrival of Joan of Arc and then helped her to win the battle of Patay (1429). After taking Chartres (1432) and forcing Bedford to raise the siege of Lagny, he drove the English from Paris (1436), and then reconquered Guienne and Normandy.

Dunraven and Mount-Earl, Windham Thomas Wyndham-Quin, Fourth Earl of (1841-1926), English politician, sportsman. In 1893 Lord Dunraven's *Valkyrie II*. competed for the America cup, but was beaten in all three races by the *Vigilant*. His *Valkyrie III*., in 1895, lost the first and won the second race against the American *Defender*, but was disqualified by the Regatta Committee on the ground that she had fouled the *Defender*, who was adjudged the winner of the second race. For the third race Lord Dunraven brought *Valkyrie III*. down to the mark; but after crossing the line so as to give the *Defender* a start, he withdrew from the contest. As president of the Irish Reform Association he initiated the movement known as 'devolution.'

Dunsany, Edward John Moreton Drax Plunkett, Lord (1878-), Irish author and dramatist. He took part in the South African War and the Great War and was severely wounded in 1916. He succeeded his father as 18th Baron in 1899. Among his books are: *Time and the Gods* (1906); *The Chronicles of Rodriguez* (1922). His plays include: *The Glittering Gate* (1909); *A Night at an Inn* (1916); *Fame and the Poet* (1919); *If* (1921).

Dunsinane, hill (1,012 ft.), in the Sidlaws, Perthshire, Scotland. The defeat here of Macbeth by Siward, Earl of Northumbria, in 1054, has been immortalized by Shakespeare.

Duns Scotus, Johannes (?1265 or ?1274-1308), mediæval philosopher and scholar. He early entered the Franciscan order, studied at Oxford, and lectured (1300) there on philosophy and theology. In 1304 he removed to Paris, where he acquired the title of Doctor Subtilis ('the Subtle Doctor'), and in 1308 was sent to Cologne to found a university, but died shortly after reaching that city. Duns Scotus was the chief ornament of the Franciscans, as Thomas Aquinas was of the Dominicans. As Aquinas made the understanding (*intellectus*) the basic principle in his system, so Duns Scotus glorified the will (*voluntas*). In 1639 Duns Scotus' collected works, except the Biblical commentaries, were published at Leyden in 12 vols. folio, edited

by Luke Wadding. See AQUINAS, THOMAS; SCHOLASTICISM. Consult Werner's *J. D. Scotus*; Pluzanski's *Essai sur la philosophie de Duns Scotus*; Royce's *Conception of God*; Seeberg's *Die Theologie des J. Duns Scotus*.

Dunstan, Saint (c. 925-988), English prelate and statesman, was born near Glastonbury. After spending a short time at the court of King Athelstan, he became a monk and settled in Glastonbury. In 945 King Edmund appointed him abbot of Glastonbury, and the monastery soon became famous as a center of learning. With the death of Edred (955) and accession of Edwy, Dunstan was deprived of his honors and he fled to the monastery of Blandigny near Ghent. Two years later he was recalled by Edgar, who created him Bishop of Worcester (958), Bishop of London (959), and Archbishop of Canterbury. He was canonized, May 19 being his day.

Dunster, Henry (c. 1612-59), American educator, was born in Lancashire, England, and received his education at Cambridge University. He went to America as a religious refugee in 1640 and was at once made first president of Harvard College, a position which he filled with marked ability. His opposition to infant baptism caused a request for his resignation in 1654.

Dunwoody, Henry Harrison Chase (1842-1933), American meteorologist, was born in Highland co., O. He supervised the official weather forecasts, organized the State weather services and originated the system of hot and cold wave warnings. In 1904 he was retired with the rank of brigadier-general. He discovered and secured patents for a crystal detector for wireless waves (see WIRELESS TELEGRAPHY), an automatic machine gun, and gas-producing shrapnel. His papers published by the Signal Service are important contributions to the science of meteorology.

Duodecimals, a term applied to an arithmetical method of ascertaining the number of square feet and square inches in a rectangular space whose sides are given in ft. and inches. It is also called *duodecimal* or *cross multiplication*.

Duodenum. See **Intestines**; also **Digestion**.

Dupanloup, Felix Antoine Philippe (1802-78), bishop of Orleans, France. In 1849 he became Bishop of Orleans. Dupanloup was the most influential ecclesiastic of his time in France, and the acknowledged leader of the Liberal Catholics in their opposition to Rome. He defended the temporal authority of the

pope in the remarkable pamphlet *La Convention du 15 Septembre et Encyclique du 9 Decembre 1864* (1st and 34th ed. 1865).

Dupin, André Marie Jacques (1783-1865), French statesman, was born in Varzy in Nièvre, and became an advocate (1800). Louis Philippe appointed him a member of his first cabinet, and he was also made *procureur-général* of the Court of Cassation. Eight times between 1832 and 1848 he was elected president of the Chamber. Dupin was the author of *Principia Juris Civilis*, a standard legal work in 5 vols. (1806).

Dupin, François Pierre Charles, Baron (1784-1873), French economist and mathematician.

Dupleix, Joseph François (1697-1764), governor of the French Indies, was born in Landrecies, and in 1742 was appointed governor-general of all the French Indies. When war broke out in Europe between France and England (1744), Dupleix strove hard to establish French ascendancy in India. But Clive's brilliant Arcot expedition and subsequent victories caused the complete failure of Dupleix's plans, and he was recalled by Louis xv. (1754). See Malleson's *Dupleix in Hunter's 'Rulers of India Series'*.

Duponcaeu, Pierre Etienne (1760-1844), French-American lawyer and scholar, was born in Ile de Rhé, France. He went to America in 1777 as secretary to Baron Steuben, and fought as a captain in the Revolution. In 1781 he became secretary to Robert Livingston, head of the department of foreign affairs, and in 1785 was admitted to the Philadelphia bar, where he won a high reputation.

Du Pont, Alfred I. (1865-1935), banker, one time head of E. I. du Pont de Nemours & Co., was later chairman of the board of the Florida National Bank of Jacksonville.

Du Pont, Irénée (1873-1942), officer, was born in Wilmington, Del., and educated at Mass. Institute of Technology. From 1919-26 he was president of E. I. du Pont de Nemours & Co., vice chairman of the board 1926-. He is also a director of Gen. Motors Corp. and vice-president of Christiana Securities Co.

Du Pont, Lammot (1880-), Pres. E. I. du Pont de Nemours & Co., was born in Wilmington, Del., and educated at Mass. Institute of Technology. He is chairman of the board of Gen. Motors Corp., and a director of other companies and banks.

Du Pont, Pierre Samuel (1870-),

manufacturer, born in Wilmington, was educated at the Mass. Institute of Technology, and is now chairman of the board of E. I. du Pont de Nemours & Co., and also a director of various companies. He is chairman of the Industrial Advisory Board of the U. S., and was active in working for repeal of the 18th Amendment to the U. S. Constitution, serving as chairman of the United Repeal Council.

Dupont, Samuel Francis (1803-65), American naval officer, was born at Bergen Point, N. J. In November, 1861, he successfully attacked Port Royal, destroyed many other fortifications, and established blockading stations all along the Southern coast. For these services he was promoted rear-admiral in 1862.

Dupré, Jules (1811-89), French landscape painter of the romantic school, was born in Nantes. He is the painter of the *Seine Sunsets*, of the *Forest of Fontainebleau*, and of many other landscapes and familiar scenes.

Dupuis, Charles François (1742-1809), French scientist, was born near Gisors, in the department of Oise. In 1794 his *Origine de tous les cultes* was published which excited great controversy.

Dupuy de Lôme, Stanislas (1816-85), French naval constructor, was born near Lorient. He designed (1848) the *Napoléon*, the first French war-steamer; transformed sailing men-of-war into steamers; and superintended the building (1858) of the first French ironclad, *La Gloire*. During the war of 1870 he turned his attention to balloons.

Dupuytren, Guillaume, Baron (1777-1835), French surgeon, was born near Limoges. He made improvements in surgical procedure, invented several useful instruments, and made notable contributions to the science of morbid anatomy.

Duquesne, Fort, a French fort built in 1754, on the site of what is now Pittsburgh, Pa. It was the objective of Braddock's ill-fated expedition of 1755 (see BRADDOCK, EDWARD), and nearby (about half a mile from the fort) Major Grant was badly defeated by the French on Sept. 14, 1758. General Forbes erected a stockade around a group of soldiers' and traders' huts, which he called Pittsburgh, and subsequently (1759) General Stanwix built the modernized Fort Pitt in place of the old French works. See PIRTSBURGH.

Duquesnoy, François, popularly known as François Flamand (1594-1646), Flemish sculptor, was born in Brussels. He attained

great eminence for his figures of children. His principal works are *St. Susanna*, in the Loreto church at Rome, and *St. Andrew*, in the basilica of St. Peter's.

Duran. See **Carolus-Duran**.

Durance, river, France, in the department of Hautes-Alpes, rises near Briançon, and flows southwest, w., and northwest, to empty, after 220 m., into the Rhone.

Durand, Alice Marie Céleste (1842-1902), French novelist, known under the pseudonym of 'Henry Gréville,' was born in Paris.

Durand, Asher Brown (1796-1886), American painter, was born in Jefferson, N. J. He studied engraving, his most noted plate being the engraving of Trumbull's *Signing of the Declaration of Independence*. With Cole he was the earliest of the first American school of landscape painters. He was a founder of the National Academy of Design and its president from 1845 to 1861.

Durand, William Frederick (1859-), American marine engineer, was born at Bethany, Conn. His publications include: *Resistance and Propulsion of Ships* (1898); *Practical Marine Engineering* (1901); *Motor Boats* (1907).

Durango, city, Mexico, capital of Durango State, is situated on a level plain formed by the foothills of the Sierra Madre; 300 m. southeast of Monterey. The Cerro Mercado, a mountain of almost pure hematite near the city, contains, above ground alone, ore amounting to many million tons; p. 50,000.

Durango, inland state of Mexico, separated from the Pacific by the narrow state of Sinaloa. It is traversed from northwest to southwest by the Sierra Madre range. Durango's mineral riches, not only in the precious metals, but in iron, lead, copper, sulphur, and rubies, have hardly been touched, in spite of the immense quantities of gold and silver already taken out.

Durant, Will (William James) (1885-), American author and educator; he taught at Columbia University. Among his works are *The Story of Philosophy* (1926), *Adventures in Genius* (1931).

Durant, Henry Fowle (1822-81), American philanthropist, whose original name was Henry Wells Smith, was born in Hanover, N. H. In 1871 he founded Wellesley College, erecting and equipping at a cost of \$1,000,000 a building which was opened in 1875, and endowing it with an income of \$50,000.

Durazno, a well-built, prosperous city of

Uruguay, capital of the department of the same name, on the Yi River. It is the center of a fertile agricultural region, and has considerable commerce; p. 17,000.

Durazzo (Turkish *Drach*; Latin *Dyrrhachium*), seaport, Albania, on the eastern coast of the Adriatic; 50 m. s. of Scutari. The harbor is naturally an excellent one, and with improvements could be made the best on the Adriatic; p. about 6,000. Following the outbreak of the Great War, the Austrians captured the city on Feb. 28, 1916. It became the seat of the provisional government as organized at the close of the Great War, but was superseded by Tirana in 1921.

Durban (**Port Natal**), the seaport of Natal, Union of South Africa, on Durban Bay. It is a popular resort, having bay and sea beaches, and parks and gardens of exceptional beauty and extent. Durban is one of the leading commercial ports in South Africa. The exports include maize, wool, coal from Natal mines, and acacia bark. The city was founded in 1824 as an English trading station; p. whites, 54,230; total, 140,324.

Durbar, the audience chamber or court of justice of an Indian prince or ruler. The term is also applied both to business and ceremonial assemblies. A magnificent gathering of native chiefs in durbar took place at Delhi when Queen Victoria was proclaimed Empress of India (Jan. 1, 1877), and when Lord Curzon proclaimed King Edward VII. Emperor of India (Jan. 1, 1903). On Dec. 12, 1911, King George V. held his own durbar, the first English king to announce his coronation in person. The ceremony called together 250,000 people from all parts of India, for whom a camp city was built.

Durchmusterung, a German word used in astronomy to designate a catalogue of stars to 9.5 or 10.0 magnitudes, intended for purposes of identification rather than of precision. The first work of the kind, executed by Argelander in 1852-9, embraced 324,198 stars, from the North Pole to 2° of south declination; and 30,000 stars situated between that limit and the Tropic of Capricorn were added by Schönfeld (1875-85). The extension to the South Pole of the Bonn *Durchmusterung*, contributed about 800,000 further stars to this great census. A photometric *Durchmusterung*, giving the comparative brightness of all stars to 7.5 magnitude north of —40° declination, was issued by Professor Pickering in 1901.

Dürer, Albrecht (1471-1528), German painter and engraver, was born in Nuremberg.

He was apprenticed for three years to the painter Michael Wohlgemuth (1486), travelled for several years, and in 1494 settled in Nuremberg. During the next ten years he executed many of his most important copperplates, such as *Adam and Eve*, *The Nativity* (1504); the series of magnificent woodcuts illustrating the Apocalypse (1498); and his first important painting, *The Adoration of the Magi* (dated 1504, now in the Uffizi Gallery, Florence). To 1500 also belongs the fine portrait of himself in the Munich Gallery. In 1506 he painted the small *Crucifixion* (Dresden). Journeying to North Italy, in Venice Dürer painted his famous *Feast of the Rosary*. On his return to Nuremberg he produced *The Assumption of the Virgin* (1509, unfortunately destroyed by fire), and *The Adoration of the Trinity* (1511, Vienna). To this year also belongs the famous series of wood engravings—*The Life of the Virgin*, *The Great Passion*, and *The Little Passion*.

Among his finest copperplates are *The Knight, Death, and the Devil* (1513), *St. Jerome in His Chamber* (1514), and the series of beautiful plates known as *The Little Passion* (1508-13). To 1515 are dated the celebrated borders cut in wood for the prayer-book of the Emperor Maximilian, while in 1519 he visited Augsburg, and painted the portrait of the Emperor Maximilian, and thereafter executed the two large series of woodcuts, *The Triumphal Arch of the Emperor Maximilian*, and *The Triumphal Car of the Emperor Maximilian*.

In 1520-21 Dürer travelled, with his wife, in the Netherlands, and of this journey he has left an account in his journal, which was translated by W. B. Scott and Mrs. Heaton in their *Lives of Dürer*. His last work—two paintings of four Apostles, of John and Peter, of Mark and Paul (Munich), presented by himself to his native city, where he died—is usually considered his highest achievement in oils. Dürer is the culminating point of mediæval German art, with its perfections and limitations, its gloomy traditions and fantastic crudities. Consult Furst's *Dürer* (1910); Hind's *Albert Dürer* (1911); Buerkner's *Dürer* (1911).

Duress, force, actual or threatened, which puts one in fear of bodily harm or imprisonment. Duress in the legal sense causes one to do something he would not do voluntarily, and is a defence to an action or an obligation entered into under such circumstances. A contract may be avoided for duress. If a will or

conveyance of property is executed under duress, it may be set aside by the person who executed it, or his heirs.

Durham, maritime county in the n.e. of England, between the Tyne on the north and the Tees on the south, with an area of 649,244 acres. The contour of the coast has been greatly affected by inundations of the sea. The west part comprises tracts of elevated moorland, with hills and mountains, and there are considerable tracts of lowland in the east and south. The principal rivers are the Wear, the Tees, and the Tyne. A large part of the county is occupied by an extension of the great northern coal field. Agriculture is carried on, and there is some stock raising, the Durham ox being famous. Shipbuilding is extensively carried on. The county contains relics of the Roman occupation. Between 547 and 827 it was part of Northumbria. The later history of the territory is largely connected with the repeated invasions of the Scots.

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Durham, city, North Carolina, county seat of Durham county. It is the seat of Trinity College, a school of fine arts, conservatory of music, and the Watts Hospital. It is an important tobacco centre and has large cigarette factories, tobacco bag and pouch factories, cotton and hosiery mills dyestuff and fertilizer plants, and wood and iron works. Near here, on April 26, 1865, Gen. J. E. Johnston surrendered to General Sherman; p. 60, 195.

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Düsseldorf, city, Prussia, in the Rhineland, on the right bank of the Rhine. A handsome modern bridge spans the Rhine at this point, and the city is attractively laid out with fine streets and many gardens. Notable buildings are the Town Hall, dating from the sixteenth century and recently enlarged; the Church of St. Lambert, a fourteenth century Gothic edifice; the Church of St. Andrew, containing the tombs of Count Wolfgang William and Elector John William; the Academy of Art, founded in 1767, and since 1819 one of the most influential art centres in Germany; the Museum of Industrial Art; the Provincial Ständehaus; and the Stadt Theatre.

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Dust, Atmospheric. Atmospheric dust comes from various sources, such as the salt from the ocean spray, meteoric dust, volcanic dust, condensed gases, and combustion dust. It is composed of organic and mineral matter (60 to 75 per cent. of mineral), and the particles measure from .01 to .001 millimetre. Their descent is gradual, being retarded by atmospheric agitation; but observations made in Paris show that from 2 to 9 milligrammes may collect on an exposed surface of one square metre in 24 hours. The dust particles may be counted by various methods, of which several commonly in use involve the use of plates, specially prepared with oil or resin to catch the dust. It is calculated that 4,000,000,000 particles may be sent into the air in

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Dutch East Indies, constituting the Dutch possessions in Asia, and consist of Java and Madura and the 'Outposts,' the last including Sumatra, the southeast and west parts of Borneo, the Riau-Lingga Archipelago, Banca, Billiton, Celebes, the Moluccas, the Timor Archipelago, the smaller Sunda Islands, and the north and west of New Guinea. They cover an area of 735,268 sq. m. and have a population (estimated, 1940) of 70,476,000 chiefly Indonesians (pure natives) and Malays.

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British and French Guiana. Its coast line is 240 m. long. The southern boundary was determined by treaty with Brazil (1906) to be the watershed (about 500 miles from the coast) between the basin of the Amazon on the south and the basins of the rivers flowing north into the Atlantic Ocean. Since 1900, six exploring expeditions under government support have traced the chief rivers to their sources; have made valuable contributions to the scientific knowledge of the southern section and its inhabitants, and have surveyed parts of the Tumuc-Humac Mountains. The population is composed of much the same constituents as that of British Guiana. A peculiar element are the bush negroes, the descendants of runaway slaves. The settlements are spread over the coast zone on the river banks. Gold is found in the river valleys, and the bauxite mines furnish nearly 60 per cent of the United States aluminum industry's requirements. In 1941 Surinam was added to other United States military outposts in foreign countries.

Surinam was first colonized by Lord Willoughby, governor of Barbados, in 1665, and was ceded to the Dutch in 1667 in exchange for the New Netherlands. It was again in the hands of the British from 1799 to 1802, and from 1804 to 1815. Area 46,060 sq. m.; p. 92, 142.

Dutch Harbor, U. S. naval and air base on Unalaska island, one of the Aleutian chain, Alaska. June 3, 1942, Japan raided the base, and June 7 a battle between American and Japanese forces raged near it.

Dutch Metal is an alloy of about 11 parts of copper to 2 of zinc, the proportions, varying according to the color, which may be from copper to pale gold. It is easily distinguished from real gold, being soluble in nitric acid.

Dutton, Edward Payson (1831-1923), American publisher, bought several of the older publishing firms and established the firm known by his own name in New York.

Dutton, Samuel Train (1849-1919), American educator. He was professor of educational administration at Teachers College, Columbia University, and superintendent of its schools (1900-1915). He lectured on education at Harvard, and at the Universities of Copenhagen, Upsala, and Christiania. He was chairman of the first National Arbitration and Peace Congress (1907).

Duval, Claude (1643-70), highwayman, was born in Normandy. Crossing to England at the Restoration, he became noted for his combined audacity and gallantry, chiefly on

the Bath and Portsmouth Roads. He was captured near Covent Garden, London, and executed at Tyburn.

Duveneck, Frank (1848-1919), American painter, was born in Covington, Ky. Early in the seventies he removed to Munich, Germany, where he studied under Dietz. His group of portraits exhibited at the Boston Art Club in 1875 attracted general attention. He exerted great influence on American art as an instructor. Some of his notable paintings are *A Turkish Page*; *A Circassian*; *Italian Girl*; *The Professor*.

Duveyrer, Henri (1840-92), French explorer and geographer, was born in Paris. He undertook, in the service of the French government, the exploration of the Sahara (1858), which lasted until 1861. He next made an expedition to Tunis (1874). In 1876 he headed a political mission to Morocco, and published valuable contributions to Berber ethnology and linguistics. His principal works are *Exploration du Sahara* (1864); *La Tunisie* (1881).

Duxbury, town, Plymouth co., Massachusetts, 30 m. southeast of Boston, on Massachusetts Bay. It is chiefly a residential town and summer resort. The house of John Alden, built in 1651, and the Miles Standish Monument are landmarks of historic interest. Duxbury was permanently settled in 1632; p. 2,-359.

Duyckinck, Evert Augustus (1816-78), American author, was born in New York City. He was graduated (1835) at Columbia, and was admitted to the bar (1837). He preferred literary work, however, and from 1840 to 1842 edited, with Cornelius Mathews, a monthly periodical entitled *Arcturus, a Journal of Books and Opinion*. With his brother, GEORGE LONG DUYCKINCK (1823-63), he edited the New York *Literary World* from 1847 to 1853, excepting one year. The principal work of the brothers Duyckinck, however, was their *Cyclopædia of American Literature* (1856), which contains biographies and critical estimates of American authors up to the date of its publication. His other works include *National Gallery of Eminent Americans* (1866); *Biographies of Eminent Men and Women of Europe and America* (1873-4). He edited a *History of the World* (compiled chiefly from the *Encyclopædia Britannica*), the works of Sydney Smith, Philip Freneau, and (with Bryant) Shakespeare. He presented his valuable collection of books to the Lenox (now the New York Public) Library (1878).

D. V., *Deo volente* (God willing).

Dvina, or **Dwina**, two rivers of Russia (1.) The North Dvina rises in two head streams in Vologda, flows northwest, and falls into the White Sea, 25 miles below Arkangelsk (or Archangel), which stands at the head of the delta. Total length, 780 miles. The Catherine Canal unites this basin with that of the Volga, and the Kirilov Canal joins it to the Neva and the Baltic. (2.) The West or Baltic Dvina rises in the government of Tver, close to the sources of the Volga and Dnieper. It is connected with the Volga by canals. Its whole course is 640 miles.

Dvinsk, town and fortress of Vitebsk government, Russia, on the Dvina River. It was founded by the Germans in 1277, but has belonged to Russia since 1772. In 1893 its old Slavonic name was restored (Dvinsk for Dünaburg). It is an important strategical centre and an army post. It is a leading commercial city for Northwest Russia; p. 95,000.

Dvořák, Antonín (1841-1904), Bohemian musical composer, was born near Kralup. He became a member of the orchestra in the Czech Theatre at Prague, and in 1873 was appointed organist of St. Adalbert's Church in the same town. His *Slavonic Dances* (1878) first made him widely known. From 1892 to 1899 he was director of the National Conservatory of Music in New York, and in 1901 was appointed director of the Prague Conservatory. His symphony entitled *From the New World* was produced in New York in 1893. His choral works contain some fine writing, the best of them, perhaps, being his *Stabat Mater* and *The Spectre Bride*, composed for the Birmingham Festival of 1885. His chamber music, piano compositions—notably his *Slawische Tänze* for two pianos—numerous songs, and miscellaneous pieces all reach a high standard. Consult Mason's *From Grieg to Brahms* (1908).

Dwarf, or **Pygmy**, a human being much smaller than the norm for its age, or one of a race much smaller than the human average; also applied adjectively to animals and plants. Dwarfing of individuals implies some form of arrested development. Recent studies in stimulation or retardation of growth by glandular control promise to add much to scientific knowledge and to medical practise along these lines. See GLANDS. Historically, dwarfs were often court pets in royal or noble families during the Middle Ages.

The most notable American dwarf was Charles S. Stratton (1838-83), better known as 'Tom Thumb,' who at twenty-five was 31

inches high. He married Mercy Lavinia Bump (Warren), then smaller than himself.

Dwarf Races or Pygmies are scattered over much of the globe; have been known to history, tradition, literature, and art since records begin; and were reported by an unbroken line of travellers. They were, however, believed fabulous by all modern peoples till a generation ago, and even then scepticism yielded reluctantly to facts. Africa contains far the greatest number and variety of pygmy races. It is now known decisively that negroid dwarfs (4 feet 9 inches to 4 feet) of at least two utterly distinct stocks inhabit large sections of Africa, and a third one parts of Southeastern Asia, Melanesia, etc., in significant geographical relations. (1) Negrillos, all forest dwellers, in a belt some six degrees wide halved by the Equator, from the Semliki River in Uganda to the Congo and Gabun; Akkas, Wambutti, Batwa. (2) Bushmen of South Africa, differing in every physical trait: color (yellow), height (taller), head shape, face, eyes, and hair. (3) Negritoes of Asia and Melanesia. Remembering that land where is now the Indian Ocean once joined an Indo-African continent, the theory is plausible that a common ancestry unites at least the Negrito and Negrillo types—perhaps the original of all negro races, possibly even nearest to primitive man. See separate articles on the more important dwarf tribes, as BUSHMEN; NEGRITTO.

Dwarf Snake, any one of a large number of small, harmless reptiles composing the group Calamariinae, widely distributed throughout the warmer parts of the world. The genus *Carpophis* is common in the Southern United States, where it is represented by several species.

Dwarf Trees are produced by planting seedlings in small pots of poor soil; by grafting on dwarf, slow-growing stock; or, in China, by cutting a ring of bark off some fruit-bearing branch, and covering the stripped part with scantily moistened clay. When roots are struck, the branch is cut off and planted in poor soil. They are some times only six inches high, yet attain a great age.

Dwarfs, a place of Hindu pilgrimage, Gujarat, Bombay, India, celebrated as the birth-place and residence of Krishna, to whom a great temple is dedicated.

Dwight, Henry Otis (1843-1917), American missionary, was born in Constantinople, Turkey. He was business agent at Constantinople (1867-72), and then editor of Turkish

publications (1872-99), for the American Board of Commissioners of Foreign Missions; serving also as Constantinople correspondent for the *New York Tribune* (1875-92). He has written: *Constantinople and Its Problems* (1901); *A Moslem Sir Galahad* (1913).

Dwight, John Sullivan (1813-93), American music critic, was born in Boston, Mass.; he was instrumental in founding the Harvard Musical Association; joined the Brook Farm Association, and became musical editor of *The Harbinger*; in 1852 he founded the first musical periodical in the United States, *The Journal of Music*.

Dwight, Nathaniel (1770-1831), American physician, was born in Northampton, Mass.; served as assistant surgeon in the U. S. Army. His publications include: *A Short System of the Geography of the World* (1795); *Sketches of the Lives of the Signers of the Declaration of Independence* (1830).

Dwight, Sereno Edwards (1786-1850), American educator, was born in Greenfield, Conn.; was president of Hamilton College. His publications include *Memoirs of David Brainerd* (1822); *Life of Jonathan Edwards* (1830), whose works he edited; *Select Discourses* (posthumously, 1851).

Dwight, Theodore (1764-1846), American journalist, was born in Northampton, Mass.; was editor of the *Hartford Mirror*; of the *Albany Daily Advertiser*; and of the *New York Daily Advertiser*. His publications include: *History of the Hartford Convention* (1833); *The Character of Thomas Jefferson as Exhibited in His Writings* (1839).

Dwight, Theodore William (1822-92), American jurist, was born in Catskill, N. Y. In 1858 he was appointed professor of municipal law at Columbia, where he organized the law department, and served as its warden until 1891, when he became professor emeritus. He was a member of the New York Commission of Appeals, 1874-5; president of the New York Prison Association; and associate editor of *The Annual Law Register*. His publications include: *Trial by Impeachment* (1867); *Report on the Prisons and Reformatories in the United States and Canada* (with E. C. Wines, 1867).

Dwight, Timothy (1752-1817), American clergyman and educator, was born in Northampton, Mass.; during the Revolutionary War was for some time a chaplain in the Continental Army. From 1795 until his death he was president and professor of divinity at Yale. Consult M. C. Tyler's *Three Men of Letters*.

Dwight, Timothy (1828-1916), American educator and theologian, born in Norwich, Conn. From 1858 to 1886 he was professor of sacred literature and New Testament Greek at Yale Divinity School; and from 1886 to 1899 was president of Yale, which assumed the status of a university during his administration. He was editor of the *New Englander*, 1856-74, in which he published a notable series of articles, 'The True Ideal of an American University,' 1870-1; and was a member of the American Committee for the Revision of the English Bible, 1878-85.

Dwight, William Buck (1833-1906), American geologist and educator, was born in Constantinople, Turkey; founded the Englewood Female Institute; was principal of the officers' family school, West Point; and in 1878 became professor of natural history and curator of the museum at Vassar College. He invented the petrotome, a machine for cutting thin sections of minerals, and made valuable geological researches.

Dwina, river in Russia. See **Dvina**.

Dyaks, or **Dayaks**, the Malay name for a number of aboriginal tribes that inhabit the mountains of Central Borneo and sections of the coast. Cloth weaving, metal work, the manufacture of steel weapons, and basketry are the principal occupations; and they are noted for the construction of remarkable suspension bridges of bamboo poles and withes. Their chief weapon is the blowgun. They formerly practised head hunting, which had a religious significance, but the custom is now almost obsolete. See BORNEO. Consult E. H. Gomes' *Seventeen Years Among the Sea Dyaks of Borneo* (1911); C. Hose's *The Pagan Tribes of Borneo* (with W. McDougall; 2 vols., 1912).

Dyce, Alexander (1798-1869), British dramatic editor and critic, was born in Edinburgh. Dyce's admirable edition of Shakespeare, in nine volumes, originally appeared in 1857; and he also edited the poems of Shakespeare, Pope, Akenside, Beattie, Peele, Greene, Webster, and Marlowe. In 1856 he published his *Recollections of the Table Talk of Samuel Rogers*, and compiled a useful and comprehensive Glossary of Shakespeare (new ed. 1902).

Dyce, William (1806-64), Scottish painter and etcher, was born in Aberdeen. He was elected R.A. in 1848. His report for the government on Continental art schools (1838) led to the remodelling of the English schools of design. The most important exam-

ples of his frescoes are in the House of Lords and in Westminster. Among his works are: *Bacchus Nursed by the Nymphs of Nysa* (1827); *The Descent of Venus* (1836); *Jessica* (1843); *Joash Shooting the Arrows of Deliverance* (1844); and a *Madonna and Child* (1846). He wrote *The National Gallery* (1853).

Dyck, Sir Anthony Van. See **Van Dyck**.

Dyeing. The art of dyeing is of unknown antiquity, and in some crude way has been in use among a majority of uncivilized races. In early history some nations were specially famous for their dyestuffs: thus the Tyrian purple was much sought after by kings, and is still associated with royalty. The art of dyeing in black, yellow, green, and other colors is said to have been brought from India to Greece by Alexander the Great, and thence the knowledge spread throughout the Roman world. Through the Middle Ages the art developed greatly, especially in Florence and Northern Italy. With the discovery of the New World new and valuable dyestuffs were introduced; and subsequently improved processes and the further discovery of natural coloring matters mark the advance of the art until about the middle of the nineteenth century. Since then natural dyestuffs have been gradually giving way to the ever-increasing artificial dyes derived from coal tar. In addition to the textile industry, dyestuffs play an important part in the manufacture of ink, paint, varnish, paper, leather, and feathers.

If a piece of mixed fabric, consisting of wool, silk, and cotton, is immersed in a weak aqueous solution of fuchsin or methyl violet, and stirred while the solution is heated to boiling, a remarkable difference will be observed in the appearance of the fibres after washing. The wool and silk will have been dyed a light or dark shade, according to the strength of the solution; while the cotton will have been only slightly stained—so slightly as to be of no practical use. In order to obtain a satisfactory color in the case of the cotton, it must first be prepared with a *mordant*, which will combine with the dye, and fix it in an insoluble form in the fabric. The mordants commonly employed are soaked into the fibres in solution, and decomposed there into insoluble compounds, usually by the action of heat and moisture.

(1) Natural Dyes.—*Logwood* or *Campeche-wood*, obtained from *Hæmatoxylon campechianum*, a tree growing in Central America, is still extensively used for dyeing silk, and less

so for cotton and wool. It is an adjective dye, giving blue to black with dichromates, violet with aluminum salts, slate to black with iron salts, dull greenish blues with copper salts, and reddish violet with tin salts.

Cochineal is still used in wool dyeing for the production of fast crimsons and scarlets. *Weld*, *Old Fustic*, *Young Fustic*, *Turmeric*, *Quercitron*, *Flavin*, and *Persian Berries* give yellow colors which are not very fast. *Catechu*, *Black Catechu*, or *Cutch*, finds extensive application in cotton and silk dyeing for the production of fast browns. *Indigo*, or *Indigo Blue*, is employed in the dyeing of wool and cotton, chiefly yarn or piece goods. Natural indigo has been largely supplanted by synthetic products. Indigo is insoluble in ordinary solvents, but is converted by reducing agents—a mixture of copperas and slaked lime—into a colorless soluble body, *indigo white*. This is absorbed by textile fibres, and on subsequent exposure to the air is re-oxidized to indigo.

(2) Synthetic Dyes.—The following are the principal classes:

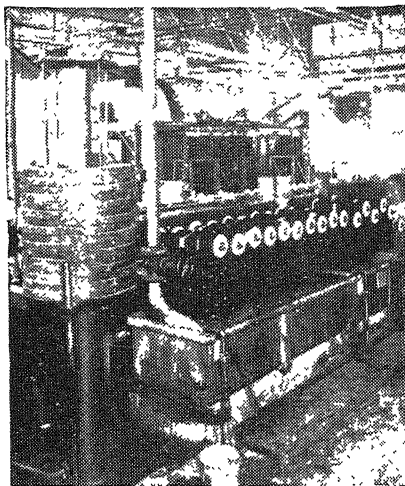
Nitro-Derivatives, including Aurantia, Picric Acid, Martius Yellow, Naphthol Yellow, and Victoria Orange. Used in wool and silk dyeing, giving full and brilliant shades, but not fast to light. *Azoxy-Derivatives*, including Curcumin S., Direct Yellow G., Direct Orange 2 R., Mikado Orange G., and Mikado Brown. They dye all fibres directly, and are principally used for cotton and silk. *Azo-Derivatives*, including Amido-azo, Oxy-azo, and Benzidine colors. Their application is extremely simple, wool and silk being dyed in either a neutral or an acid bath; with cotton, some chloride, carbonate, sulphate, or phosphate of sodium is added.

The so-called *Naphthol Azo-Colors* are produced upon the fibre direct, and are obtained by the action of diazotized aromatic amines upon naphthol in alkaline solution. *Triphenylmethane Dyes*, including Magenta, Malachite Green, Victoria Blue, Night Blue, Auramine, Crystal Violet, Methyl Violet, Hofmann's Violet, Soluble Blue, and Spirit Blue. *Phthalein Dyes* are related to the triphenylmethanes, and include the *eosins*, *erythrosin* and *gallein*. They produce extremely brilliant colors, but are fugitive and changed by light. Wool and silk are dyed in a slightly acid bath. *Alizarin Dyes*, including Alizarin, Alizarin Red, Alizarin Yellow, Galloflavine, Alizarin Blue, Anthracene Brown, Anthracene Orange, Anthracene Yellow, Alizarin Black, Alizarin Green.

Purpurin, Anthrapurpurin, Alizarin Indigo Blue. These are extensively used for producing fast colors on all fibres.

Aniline Black is produced by the oxidation of aniline in the form of aniline oil, or as the hydrochloride; and according to the degree of oxidation three substances are formed—*emeraldine*, *nigraniline*, and *ungreenable black*. *Cachou de Laval* and *Vidal Black* are produced by fusing vegetable matter containing cellulose—sawdust—with sodium sulphide. They are used in cotton dyeing for producing fast shades of drab and gray.

(3) Mineral Dyes.—These are largely employed in cotton dyeing, and when mixed to-



Dyeing Process, Machinery.

gether in suitable proportions yield a wide variety of shades that are fast to light and washing.

Chrome Yellow is obtained by impregnating the fibre with a solution of some lead salt, and the latter is reacted upon to produce the color by passing through a hot dilute solution of potassium dichromate. If the fibre is then passed rapidly through boiling milk of lime, the yellow is changed to orange, and *chrome orange* results. *Iron Buff* is obtained by saturating the cotton fabric with a ferric salt, and reacting upon it by passing through weak alkali. *Manganese Brown* is obtained by preparing the fabric with a soluble manganese salt, then passing through a solution of caustic soda containing bleaching powder. *Prussian Blue* is obtained by first dyeing iron buff, then passing through a weakly acid bath of potassium ferrocyanide.

Machinery and Appliances.—Textile materials may be dyed in the loose state; as slubbing, tops, or silver; in the yarn; or in the piece. Dyeing in the piece is the simplest and cheapest method, and is employed in the majority of cases. Dyeing in the loose state or in the yarn is employed when it is desired to produce fabrics of two or more colors without printing, and sometimes for plain woolen goods of superior quality. Silk is generally dyed in the yarn, as are sewing cotton, and cotton, wool, and silk yarns.

All dyeing machinery consists essentially of an arrangement for moving the goods through the dye liquor, which is itself more or less stationary, or for causing the dye to circulate through the goods. Yarn is usually dyed in the hank, in rectangular vats of wood, stone, or metal, heated by steam coils, and provided with false bottoms to prevent the yarn from coming into direct contact with the steam. The hanks are suspended on rods placed across the vats at intervals of one or more inches, and turned, usually by hand, until all the yarn has absorbed a sufficient amount of dye. In yarn-dyeing machines the hand-turned rods are usually replaced by porcelain rollers operated from a single shaft by means of spur wheels.

Loose fibres are sometimes dyed in vats or boilers, in which they are turned by hand with poles or forks; or they may be placed in a perforated drum through which the dye is forced by means of a circulating pump or other device. In another type of machine, similar to that used for hank dyeing, the drum is made to revolve in such a manner that the fibres are alternately dipped into the dye and lifted out to drain. With some colors—notably alizarin reds, Turkey red, and aniline blacks—the dyed goods are treated with steam to develop the color, but in general this is not necessary. Most goods, however, require washing to remove the excess of coloring solution which they mechanically retain. Drying is accomplished by hydro-extractors, tentering machines, etc. See DRYING MACHINES. See CALICO PRINTING; COAL-TAR DYES.

Bibliography.—Consult Rawson, Gardner, and Laycock's *Dictionary of Dyes and Mordants*; Kent, Rawson, and Loewenthal's *A Manual of Dyeing* (2 vols., 1910); Martin's *Industrial and Manufacturing Chemistry* (1913); Matthews' *Laboratory Manual of Dyeing and Textile Chemistry* (1913).

Dyer, Eliphalet (1721-1807), American soldier and legislator, was born in Windham.

Conn.; in 1763 he was sent to England as the agent of the Susquehanna Land Company; he was a delegate to the Stamp Act Congress in 1765; and served as member of the Continental Congress during the Revolutionary War. He was raised to the bench of the superior court in 1766, and was chief justice from 1789 to 1793.

Dyer, Isadore (1865-1920), American dermatologist, was born in Galveston, Texas; founded the Louisiana Leper Home; was editor of *The New Orleans Medical and Surgical Journal*, and associate editor of *The American Journal of Tropical Diseases*; published *The Art of Medicine* (1913).

Dyer, Louis (1851-1908), American author and educator, was born in Chicago, Ill. He lectured on art at the principal educational institutions of the United States and England. His publications include: *The Greek Question and Answer* (1884); *Plato's Apology and Crito* (1886); *Oxford as It Is* (1902); *Machiavelli and the Modern State* (1904).

Dyer, or Dyar, Mary (d. 1660), American Quaker, was a victim of religious persecution in Massachusetts under a statute sentencing to death any Quaker returning to the colony after being once expelled; she was publicly hanged on Boston Common, June 1, 1660.

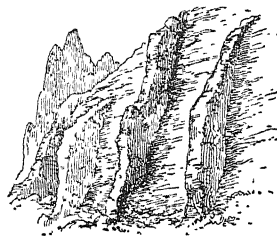
Dyer, Sir William Turner Thistleton (1843-1929), English botanist, born in Westminster; was professor of botany at the Royal College of Science in Ireland, (1870). In 1875 he became assistant director of the Royal Gardens at Kew, and later director. He is joint author of *The Flora of Middlesex* (1869); prepared the English edition of Sachs' *Text Book of Botany* (1875); and was editor of *Flora Capensis* and *The Flora of Tropical Africa*.

Dyke, or Dike, an artificially constructed embankment of earth, stone, brush, or other material erected along river banks or seashores: either (1) for the improvement of channels for navigation by contracting them over shoals, correcting excessive curvature, or securing a more evenly distributed depth of water than occurs naturally; or (2) for the protection of the banks or shores against erosion, and the prevention of inundation. Dykes for the improvement of river channels are of two main types: *longitudinal dykes*, which follow the general direction of the current, and spur dykes, which are erected at intervals of from 200 to 650 ft., and at angles of from 75 to 110 degrees with the channel.

Dykes for the protection of river banks and

seashores may be similar in construction to those for correcting river channels, or they may consist of high embankments of earth. Such dykes are found in most low-lying countries, and are especially numerous in the Netherlands. In 1574 the Prince of Orange raised the siege of Leyden by breaking down the dykes, flooding the country, and drowning many of the besieging Spaniards; and in 1914 the Belgians adopted a similar plan to arrest the advance of the Germans. See DRAINAGE; MISSISSIPPI RIVER; RECLAMATION. Consult Thomas and Watt's *The Improvement of Rivers* (vol. 1., 1913).

Dykes, or Dikes, masses of igneous rock that fill fissures in the earth's crust in more or less vertical, wall-like sheets. They occur as the result of volcanic action, and their



Dykes protruding from a Cliff.

method of origin may be seen in such active volcanoes as Etna and Vesuvius. The powerful internal forces at work both during and after active eruption produce numerous radiating fissures in the volcanic mass, into which the fluid lava forces its way, and there consolidates. When the lava is very liquid, it ascends freely into every crack; when it is very viscous, the fissures may not be injected, but remain gaping till the cavity is slowly filled up with debris by the crumbling and breaking down of its walls, in which case the resultant dyke consists not of crystalline, but of fragmental rock. See IGNEOUS ROCKS.

Dynamical Units. See UNITS.

Dynamics, a branch of mechanics conveniently subdivided into the two great branches, kinetics and statics, which treat respectively of the motion and the equilibrium of material systems. Since the discovery of the great principle of the conservation of energy, physical science has become essentially dynamical; and there are now recognized the important branches of thermodynamics or the dynamics of heat, and electrodynamics, including the whole theory of electricity and magnetism. Hydrodynamics is the branch of the subject

which deals with liquids, and aerodynamics that which deals with gases. See: Newton's *Principia* (1687) and Lagrange's *Mécanique analytique* (1788).

Dynamite, a term covering a great number of nitroglycerin explosives, which may be divided into two main classes: (1) dynamites with an inert base acting merely as an absorbent of the liquid nitroglycerin; (2) dynamites with an active, an explosive or combustible base. Of the first class, ordinary dynamite, in which the absorbent is almost invariably kieselguhr, in the proportion of about 75 per cent. of nitroglycerin to 25 per cent. of kieselguhr, may be taken as an example. Kieselguhr, a clay of almost pure silica, consists of the scales and frustules of diatoms; these minute tubes serve to hold the nitroglycerin by capillary attraction. The kieselguhr is calcined, crushed, and sifted; it will then absorb from three to four times its weight of nitroglycerin. The mixture is thoroughly incorporated by hand by kneading and rubbing through wire sieves, and is then pressed through a cylindrical mould and made up into suitably sized cartridges by wrapping in waterproof paper.

Dynamite, when set on fire in small quantities, burns quietly, unless the temperature rises rapidly, when it explodes. It is less sensitive to shock than nitroglycerin, though it can be exploded by sharp blows between hard substances. In practice, it is invariably exploded by a detonator containing fulminate of mercury fired by a fuse. Dynamite was invented in 1866 by Alfred Nobel. It is used exclusively for blasting, being three or four times as powerful as gunpowder, and having a greater pulverizing effect. Of the second class of dynamites, a variety of explosives with an active dope are in use. These consist of mixtures of nitroglycerin with sulphur, sodium or potassium nitrate, charcoal, wood pulp, etc. Blasting gelatin is made by dissolving nitrated cellulose in nitroglycerin. It is not affected by water, hence is much used for mines and torpedoes. Gelatin dynamite consists of blasting gelatin, wood pulp, and potassium nitrate. See **BLASTING**; **EXPLOSIVES**; **NITROGLYCERIN**. Consult Guttman's *Manufacture of Explosives*; Walke's *Lectures on Explosives*; Bernadou's *Smokeless Powder*; Eissler's *Handbook of Modern Explosives*.

Dynamo and Motor. All electric generators and motors are classed together as *Dynamo-Electric Machinery*. Under this head are two main groups of machines: (1) those for

direct-current circuits, and (2) those for alternating current. A dynamo, as the term is commonly used, converts the energy of mechanical motion into electrical energy, and a motor converts electrical energy into mechanical. When a conductor is moved across a field of magnetic force an electro-motive force (E.M.F.) is caused between the ends of the conductor. A current flows if the conductor is part of a complete closed circuit. The mechanical energy required to sustain such relative motion between conductor and magnetic field is very largely transformed into electric energy. This is the principle of the *dynamo*. When an electric current is forced through a conductor located in a magnetic field, a mechanical force is produced tending to move the conductor. If motion can follow, then the electric energy furnished the conductor will very largely become energy of mechanical motion. This is the principle of the *motor*.

Dynamo-Electric Machines.—The essential elements of a dynamo-electric machine are (1) a *field magnet* for producing the magnetic flux (see **MAGNETISM**), and (2) an *armature* or system of conductors which move in the magnetic field. A simple arrangement of these elements is seen in the one typical of some early motors and dynamos. The magnetic lines of flux in this case pass through the iron of the field-magnet and across the air-gap between the poles. The aim is to have all the lines of flux across the air-gap traverse the armature.

Another case shows a pair of connecting armature conductors (forming a complete armature coil, in this case) being rotated so as to cut across the magnetic flux. The coil as seen is moving so as to decrease the number of lines of flux passing through it, and the resultant induced E.M.F. tends to cause a current to flow so as to resist the movement and to strengthen the field. (See **ELECTRICITY**, **CURRENT**.) The upper conductor is seen cutting lines downward, and the lower cutting upward. This produces E.M.F. in opposite directions on the conductors, but as shown they are connected so that the E.M.F.'s are additive, and the E.M.F. between the collector rings is double that between the ends of either conductor. The E.M.F. increases directly with the rate of cutting lines of flux. In one particular position, horizontal in this case, the coil is cutting across the greatest number of lines of flux during any chosen short interval of time. The induced E.M.F. is therefore a maximum. In another particular

position, in this case vertical, the conductors momentarily move along the lines, but do not cut them, and the induced E.M.F. is zero. After half a revolution from any position, the E.M.F. is induced in an opposite direction in the coil, so that an alternating E.M.F. is generated.

When the ends of the coil are joined to two simple collecting rings on which brushes make contact, a simple alternator is obtained. When, however, the insulated split ring arrangement of the dynamo is used, and so adjusted that, at the moment when the E.M.F. is about to change its direction, the brushes which connect the inductor with the external circuit make contact with the other segment of the ring the current in the external circuit still continues to flow in the same direction through that circuit. These segments are known as the commutator. If the armature consisted of only one coil, the E.M.F., and consequently the current, would vary periodically in strength, from value zero to a maximum value. But this is easily remedied by using an armature of many distinct coils or loops suitably arranged.

One of the earliest successful dynamos was that introduced by Siemens in 1856, and known as the shuttle armature machine, in which the armature loops were wound in two deep slots cut along the surface of an iron cylinder. The next advance was to utilize more space on the armature for working conductors and at the same time to multiply the number of coils to keep the voltage more nearly constant. This resulted in the *Gramme ring armature*, invented in 1870. This is a closed coil armature—i.e., there is a complete armature electric circuit, and so from brush to brush there are two symmetrical paths for the current. The *drum winding* is an extension of Siemens' shuttle armature. In this form of armature the core is an iron cylinder. Instead of joining adjacent inductors, as in the Gramme winding, we now, in a bipolar machine, join those that are nearly opposite. This may be done in a great variety of ways, of which one is taken as an example. The two halves of it are still in parallel, and the brushes are, as before, arranged to short-circuit the coils passing through the neutral position.

In the earliest armatures the cores were solid. These, however, had large and wasteful eddy currents induced in them; and to prevent these, it was soon found necessary to build them up of thin stampings of high permeability, insulated singly, the whole form-

ing a laminated core in which eddy currents were practically non-existent. These stampings have ventilation holes, and in small drum machines are keyed direct to the shaft and held in position between end plates. In large machines they are carried on a supporting frame or spider, elaborate arrangements being made to carry away the heat generated by the flowing current. If, in place of the commutators of the Gramme and drum armatures, we put a pair of collector rings, connected respectively to opposite points of the windings, a single-phase alternator results. In fact, both collector rings and armatures can be used; in which case, both direct and alternating currents can be taken off, and the machine may be called a double-current generator. If other pairs of collector rings be added, and respectively connected to convenient opposite points of the windings, other alternating currents can be obtained, having the same frequency as the first, but differing in phase.

For simplicity and uniformity the coils in many armatures are interchangeable, being all uniformly wound on special formers, insulated and taped together in a particular way, and then fitted into their respective slots, the ends being then connected up to their proper commutator segments. In the early days of dynamo construction great varieties of shape were given to the field-magnets. At the present day the simple horseshoe, that is, the over or under type, except for small machines, is superseded by *multipolar dynamos* of a different type. Large slow-speed machines may have 50 or more poles, but ten or twelve are more common. Permanent magnets were sometimes used at first, but for all except the very smallest machines, electro-magnets are employed. The magnet cores and yokes are made of wrought iron of high permeability, or of mild cast steel, or of the softest cast iron. In most machines the pole pieces are laminated to prevent loss by eddy currents (see ELECTRICITY, CURRENT), while the rest of the magnet is of cast iron or cast steel.

Generators.—The term generator is usually applied to dynamos used for converting mechanical into electrical energy. As the electrical energy may be in the form either of direct current or of alternating current, generators are designated as direct-current generators or alternating-current generators.

DIRECT-CURRENT GENERATORS.—The feature distinguishing direct-current dynamos from alternating-current dynamos, usually at

a glance, is the presence of a commutator. The function of the elementary commutator has been mentioned above. In practice it consists of a number of copper bars, corresponding to the number of coils, carefully insulated from one another by mica, clamped firmly together, and carried on a sleeve keyed to the armature shaft, or on an extension of the armature spider. The ends of the corresponding coils are soldered into a slot at the end of the commutator bar, as in the Gramme ring and Siemens' shuttle armatures. Owing to the risk of sparking from bar to bar, and hence from one brush to the other, voltages above 2,500 cannot be safely obtained. Voltages above 1,500 are usually obtained by connecting generators in series. The brushes which collect the current are usually made of carbon, and are held by springs to bed upon the commutator surface. They may be moved or rocked into the neutral or non-sparking position by a rocker handle, or in large machines by a hand-wheel. Two sets of brushes are used for every pair of poles; but in multipolars, if commutator segments to be at the same potential are connected together, a single pair of brushes may be used.

The magnetization of the field coils is effected in different ways, and dynamos are to some extent classified by the arrangement employed. Sometimes the field is excited from a separate source, in which case the dynamo is said to be *separately excited*. In the *shunt-wound* machine the magnetizing coil is joined across the terminals of the dynamo, forming a shunt circuit, which, being of fairly high resistance, takes only a small fraction of the total current. In multipolar shunt machines the field-magnets are usually all excited in series.

In the *series machine* the whole current is led around the field magnets in comparatively few turns of coarse wire or strip copper. In a *compound machine* the two methods are combined. The product of the exciting amperes and the number of turns around the field-magnets is called the exciting ampere-turns, and these require to be carefully calculated, so as to overcome the several reluctances, or magnetic resistances, of the air-gaps and iron paths, and to give the required magnetic flux through the armatures (see MAGNETISM).

Neither the shunt nor series machine is sufficiently self-regulating for many purposes. The voltages of shunt machines are regulated by inserting and cutting out resistances in the field circuit. For special purposes generators are designed with particular characteris-

tics. The battery-charging generators used on railroad cars and automobiles are so designed as to deliver at a fairly constant battery voltage a current with relatively small variation over a very wide range of speed of the generator.

ALTERNATING-CURRENT GENERATORS. — We have seen that, by replacing the commutator of a direct-current machine with one or more pairs of collecting rings connected to definite points of the windings, alternating E.M.F.'s could be obtained whose instantaneous maximum values came at different times. These time relations depend on the relative positions of the armature and collector-ring connections. As it is the relative motion of armature and field that generates E.M.F., the armature may be stationary and the fields may revolve. Nearly all the large machines are of this type, as it simplifies the insulation problem and eliminates the collection of high-voltage currents through the slip-rings.

Since the E.M.F. varies with the rate of the conductors cutting across the magnetic field and changes direction when cutting the field in the opposite direction, it is evident that a complete cycle of E.M.F. occurs during a rotation through the angle between two poles of like polarity. The number of cycles, the frequency, may then be written $f = \frac{pn}{2}$,

where f is cycles per second, p is number of poles, and n revolutions per second. Examples of this are modern slow-speed alternators of the revolving-field type. The armature conductors are in slots in laminated iron which is supported by the outer annular casting.

The internal rotating element is the field-frame and resembles a fly-wheel in appearance. The field-poles are mounted radially on the surface of the fly-wheel, are wound with insulated copper strip, and present north and south poles alternately to the internal surface of the outer stationary armature-frame. Nearly all alternators driven by steam prime movers are turbine driven. These are more economical of foundation, floor space, etc., than reciprocating engines. A 62,500 kv.-a., 50,000 kw., turbo-alternator, is one now in use. The alternator is on the one side and the steam turbine on the other side, both being mounted on the same horizontal rotating shaft.

By placing on the armature frame one or two more additional and independent sets of coils revolving in the same field flux, the space of the machine is utilized to better advantage.

If we spaced the coils so that their E.M.F.'s had maximum values 90° of a voltage cycle apart, we would get the *two-phase* or *quarter-phase* generator. If the spacing of these sets was made for 120° , we would get the *three-phase* type. There are two ways of connecting the three coils to have three external leads, and to utilize the advantages that are gained by this. One connection is called the *delta* or *triangle*, and the other the *star* or *Y*. The common frequencies now are 25 and 60 cycles per second. In certain localities 50 cycles are used. Up to 140 and down to 15 have been used. The low frequencies are better for power service and the higher ones for lighting, as below 30 the eye can detect the resultant flicker of an incandescent lamp. In Europe 50, 25, and $16\frac{2}{3}$ cycles are common.

All of these generators need direct current to excite their field magnets. This is commonly furnished by a small separate direct-current generator, called an *exciter*. In central stations alternator voltages may be regulated (a) by hand control of rheostats, (b) automatic control of rheostats similar to hand control and (c) automatic relay operation of exciter field rheostats at a fairly rapid rate to keep bus voltage constant. Method (c) is most satisfactory for those systems which have rapid load changes. Method (b) or (a) is simpler and satisfactory for more gradual change in load as is found in large systems.

Motors.—A motor is a dynamo machine for converting electrical energy to mechanical. Motors may be divided according to their supply, their characteristics or connections, or their usage. According to the supply there are (1) direct-current motors and (2) alternating-current motors. The alternating-current motors may be further subdivided into polyphase and single-phase motors. For a discussion of the applications of the several types and comparisons, see ELECTRICAL MACHINERY.

DIRECT-CURRENT MOTORS. — The direct-current motor construction is essentially the same as the generator. The conductors carrying current in the magnetic field produce a force on the conductor dependent on the product of the current, and the strength of the magnetic field. If either the direction of the current or of the field is reversed, the force on the conductor is reversed; with both reversed, the direction of the force remains the same. The conductors are so placed and connected on the armature that the current flows in one direction under the north poles and the opposite direction under the south

poles, so that the force produced by all conductors is additive. The function of the brushes and commutator is to reconnect the power circuit to the armature, so that as the armature turns, those conductors coming under a given pole carry currents in the same direction as those which are replaced. This produces a torque independent of the particular position or speed of the armature.

As noted above, when conductors move in a magnetic field an E.M.F. is generated. This E.M.F. varies directly with the speed and with the strength of the field. Hence, in the motor, as the armature moves, an E.M.F. is produced. This E.M.F. opposes the flow of the armature current and is known as the counter E.M.F. The counter E.M.F. rises with the speed of rotation until the difference in applied and counter E.M.F.'s allows only enough current to develop a torque to overcome the mechanical forces encountered. Speed equilibrium is established. If we decrease the intensity of field magnetization, first the torque and counter E.M.F. drop; the decrease in counter E.M.F. allows more current to flow, and the torque rises to the old value to carry the load; but the counter E.M.F. has not risen, and more current is permitted, which causes an excess torque which can only go to accelerating the armature. As the speed increases now, the counter E.M.F. rises to limit the current and establish a new equilibrium at some higher speed. Therefore weakening the field current increases the speed of the direct-current motor, and strengthening the field flux causes a drop in speed.

The shunt, series, and compound-wound motors are analogous to direct-current generators. *Series motors* have only a short heavy field winding which is traversed by the armature current. As the load increases, the current must increase to develop the required torque; and as this current strengthens the field magnetism also, the torque is proportional to the square of the current. We have seen that a strengthening of field tends to decrease speed, so that in the series type the speed fluctuations with load are great. However, the heavy torque with low starting speeds is just what is needed for accelerating heavy apparatus like street cars, hoists, etc., and here the series motor has its great field. The *shunt motor*, or one where armature and field circuits are connected in parallel, serves well where only a small decrease in speed is permissible with increase of load. Where the load variations become extreme, however—as for elevators, metal punches, etc.—the sudden

speed; and the magnetic field is much disturbed, owing to the excessive current produced in the rotor. As a result, the starting torque is poor. In most cases squirrel-cage motors are started with low voltages to reduce line disturbances. This further reduces the starting torque. In order to remedy these defects, coil-wound rotors (instead of short-circuited ones) are frequently used in the larger motors, the winding being arranged so as to allow of the introduction of starting resistances into the rotor circuits through slip rings. This has the double effect of reducing the starting current and increasing the starting torque. A certain limited range of speed control with induction motors is obtained by arranging the field windings so that they can be connected to form different numbers of poles.

Polyphase induction motors are the most rugged motors built, particularly the squirrel-cage type, which has no moving contacts. Because of this simple ruggedness, they are in common use for all purposes where constant-speed motors are desired. Machine tools, locomotives, and battleships are all successfully driven by induction motors. With high-resistance rotors, squirrel-cage motors, as well as the phase-wound rotor motors, are used for hoisting and elevator work. See ELECTRICAL MACHINERY.

Induction motors are built for various speeds and in sizes from a fraction of a horsepower up to 25,000 horsepower.

Single-phase Motors. Series Type.—Reduced to their simplest form, such motors are the same as series direct-current motors. When current in both armature and field reverses simultaneously, the torque continues in the same direction. With a shunt motor placed on alternating current this simultaneous reversal does not occur, owing to the greater self-induction of the field circuit. With the series motor it does happen, as the same current flows in both. Among the single-phase alternating-current commutator motors, the *Thomson repulsion* type stands out prominently. This has a stator giving a magnetic field like the single-phase series motor, and it has an armature like that of a direct-current motor. The pair or pairs of brushes bearing on the commutator are short-circuited and placed at an angle to the axis of the field. The magnetic flux through the armature, caused by the field, may be considered to have two components—one perpendicular to the brushes, and one parallel thereto. The latter component causes current in the arm-

ature coils, and the former component reacts, developing torque.

Single-phase Induction Motors.—The construction of single-phase induction motors is much like that of a two-phase induction motor with the second phase not used. After the rotor is in motion, the rotor conductors cut the flux and generate an E.M.F. by dynamo action. This is combined with the E.M.F. generated in the rotor by pure transformer action, and the resultant currents give a magnetic flux which has a component in quadrature, mechanically and electrically, with the main rotor flux. This sets up a more or less perfect rotating field, so that, once started, the machine acts similar to a polyphase induction motor. Inherently there is no starting torque in the single-phase induction motor. Consequently some provision must be made to start the motor. The starting torque can be produced in very small motors by embedding heavy copper *shading coils* in the pole faces. The currents in these coils retard change in part of the main flux, and the persisting part of the field reacts on the rotor currents, producing torque enough to start.

Dynamometer, any apparatus for measuring force or power, as for example, the power developed by a steam engine or other motor. In practical engineering a common type is the brake, or absorption dynamometer, so-called because the energy is absorbed by frictional resistance. The entire energy so absorbed is converted into heat.

One type is a convenient form of brake for small engines. It consists of a rope encircling the fly-wheel, one end of the rope being attached to a spring-balance, and the other loaded with a suitable weight. In this form two parallel turns of the rope are found passing round the wheel, but more may be used if desirable. Wood blocks are attached at intervals to keep the ropes in position. The direction of rotation is such as to tend to lift the weights, and, in working, the weights should be lifted a short distance from the ground.

Dyne is that force which acting for one second on a mass of one gram will cause a change in its velocity of one centimeter per second.

Dysentery, an acute or chronic inflammatory disease involving the intestines. Its incidence is highest in hot climates. According to its cause, it is divided into two forms, *bacillary* and *amaebic*.

BACILLARY DYSENTERY is caused by many different types of bacilli. Infection is carried

from the patient by clothes soiled with stools containing the organism, and by water and food similarly contaminated. The disease, which usually has an acute course, prevails especially among people living in unsanitary surroundings.

AMOEBC DYSENTERY is characterized by a variable onset, irregular course, alternate diarrhœa and constipation, abdominal pain, amœbæ and mucus and blood in the stools. The disease was first recognized in the United States in 1890. It is prevalent in the Southern States, and occurs occasionally in most of the other States. A recent epidemic is that which occurred in Chicago, 1933, during the Century of Progress Exposition, from which it was carried to all parts of the United States. The principal source of infection is the water supply.

Dysodil, in mineralogy, a laminated bituminous substance found in limestone near Syracuse in Sicily, green or gray in color, and often containing remains of fishes and of plants. It is a kind of natural bitumen.

Dyspepsia, or **Indigestion**, is a medical term which covers a very wide field. The symptoms of indigestion may be due to organic disease of the stomach or intestines, or to the improper performance of the digestive functions when the alimentary canal is not

diseased. In the latter case, dyspepsia may be due to the result of bad teeth or too much haste in eating. The food is thus not properly broken up, in which case it is neither mixed with saliva nor in a condition to be easily reached by the gastric juice later. When the food reaches the stomach, it is thoroughly mixed with the gastric juice by a churning movement of the stomach walls, while the pylorus remains closed. If, however, there is insufficient gastric juice, or insufficient movement, indigestion results. These two deficiencies may be due to overeating, fatigue, or depressing emotions. As a result, there is undigested food, which retards the passage of the digested food through the pyloric opening of the stomach into the duodenum. After this food has been a certain time in the stomach fermentation is set up, and water-brash, heartburn, flatulence, eructations, and even vomiting follow. Intestinal dyspepsia may be started by unhealthy conditions of liver or pancreas. See **DIGESTION**.

Dytiscus, a genus of large and ferocious water-beetles. Both larva and adult are aquatic, the latter diving and swimming with much rapidity. Both are actively carnivorous, and are dangerous occupants for an aquarium. Wings are present, and are used to convey the insect from one pool to another.

E, the fifth letter in English and the cognate alphabets. The original symbol in the Egyptian hieroglyphs had the value of the aspirate *h* (see *H*). The Phœnicians called it *he*, a name which is supposed to have meant a 'window.' In the early Semitic alphabet *E* was turned to the left; in Hebrew the perpendicular stroke to the left seems to have been originally one of the cross bars. When the Phœnician alphabet was taken over by the Greeks, the symbol lost its aspiration, and was used to represent the vowel *e*, and was called *e-psilon* or 'bare *e*,' to distinguish it from *eta*. In Latin it had the sounds heard in the French *été*.

In English *e* has various sounds. The normal sound is heard in *get*, *bed*, *met*, which was its value, long and short, until the 15th century ('mid front wide'). Its present long value is that of the name sound *ee*, usually expressed by doubling the letter, as in *see*, *feet*, *heel*, though it is expressed by a single *e* in *evil* and in some monosyllabic words, such as *he*, *me*, *we*, *be*. The 'mid front narrow' vowel (French *été*, German *See*) is closely related, and in general scientific notation *e* may include it also (Murray *e*). In Early English *e* may have had this sound as well. *E*, in music, is the third note of the natural diatonic scale of *C*. Its major key has four sharps. (See *MUSIC*; *SCALE*.) See *ALPHABET*.

Ea, the Babylonian ocean god, identified with the Oannes of Berosus. He figures prominently in the creation and deluge stories as the creator and as the protector of mankind.

Eadmer, or **Edmer** (c. 1064-1124), Anglo-Saxon monk and historian, the secretary and biographer of St. Anselm. His chief works—the *Historia Novorum*, covering the period 1060-1122, and the *Vita Anselmi*—are said by Freeman to be of primary importance for the ecclesiastical history of his age.

Eads, **James Buchanan** (1820-87), American engineer, was born at Lawrenceburgh, Ind. He early invented a diving-bell boat and devised an apparatus for the recovery of sunken craft. In 1861, during the Civil War,

he constructed for the Federal Government within a hundred days eight ironclad steamers for use on the Mississippi and its tributaries. His steel arch bridge (1867-74) across the Mississippi at St. Louis, with its central arch embracing a clear span of 520 feet, ranks among the notable bridges of the world (see *BRIDGES*). In 1875-9 he accomplished the great task of deepening the South Pass of the Mississippi Delta by means of jetties. (See *MISSISSIPPI RIVER*.) Consult *Life* by How.

Eagle, a name applied to a large number of predaceous birds of considerable size, belonging to various genera of the family *Falconidæ*, which includes also the Hawks and the Kites. They are characterized in general by remarkable powers of flight and vision, by solitary habits, and by great duration of life, some of them reaching an age of nearly one hundred years. The bill is powerful, but rather short, high at the root, and slightly curved. Eagles are found throughout the world, but are most numerous in Europe, Asia, and Africa. The True Eagles, constituting the genus *Aquila*, and including the familiar Golden Eagle, are characterized by a strong curved bill, large and high, with the upper part much bent; long wings, with the fourth and fifth quills longest; and a broad, straight tail of moderate length; the leg feathers extend as far as the toes; and the claws are sharp and curved.

The Golden Eagle (*A. chrysaëtus*), sometimes known as the Mountain Eagle, is a magnificent bird, widely distributed in Europe, Northern Africa, Asia, and North America, where it makes its habitat in hilly and mountainous regions, preferably in unsettled country. In North America it is found chiefly in the North and West, though it occurs also in the Appalachian ranges as far south as Southern North Carolina. Other species of true eagles are the handsome Imperial Eagle (*A. heliaca*) of the warmer parts of the Old World, which was taken as a national symbol by the Roman Empire; the smaller Spotted Eagles (*A. maculata* and *clanga*) of Cen-

tral and Southern Europe; and a number of Indian and African varieties.

The Sea Eagles comprise a number of species belonging chiefly to the genus *Haliaëtus* and including the Bald Eagle, chosen as the national emblem of the United States in 1782. The Bald Eagle (*H. leucocephalus*) inhabits nearly all of North America from Northern Mexico and Florida north to Alaska. It is dark brown in color except for the white tail and the white feathers covering its head and neck, which at a distance give an erroneous impression of baldness.

Eagle, a gold coin of the United States of the value of ten dollars. There are double, half, and quarter eagles of proportionate weight and value. See COINAGE.

Eagle. In mythology the eagle usually represents the sun. Ptolemy Soter made the eagle the emblem of the Egyptian kingdom. In the Roman story, an eagle was the herald to Tarquinius of his royal power, and it was one of the most important insignia of the republic. Even in Christian symbolism the eagle has preserved to the present day its significance as the symbol of St. John the Evangelist in the lecterns of churches. As a standard of war the eagle seems first to have been used by the Persians, but the most famous eagles of antiquity were those which the Romans carried to victory. The arms adopted by the United States consist of a dark brown eagle with outspread wings, having in one of its talons a bundle of arrows, in the other an olive branch, bearing on its breast a shield whose upper part is blue and under part silver, and crossed by six red vertical bars. In its beak it holds a band with the inscription *E pluribus unum*, surmounted by thirteen stars, the original number of States. See FLAG; STANDARDS.

Eagle, Black, Order of the, a Prussian order of knighthood, founded in 1701, the highest decoration in Prussia. It is bestowed upon soldiers and civilians for distinguished military and state service, and includes a patent of nobility. See ORDERS OF KNIGHTHOOD.

Eagle Owl (*Bubo*), a genus of large owls. The prominent disc of feathers round the ear is incomplete above, there is a large free tuft on each side, and the feathers on the legs extend down to the toes. The eagle owl of America (*B. virginianus*), the Great Horned or Hoot Owl, is somewhat smaller, but very bold and powerful, and carries off with ease almost any inhabitant of the poultry yard.

It is found in nearly all parts of North and South America. See OWL.

Eagle, Red, Order of the, a Prussian order of knighthood, founded in 1705, and second in distinction to the Order of the Black Eagle.

Eagles, Order of, a fraternal and benefit society, founded in 1898. In 1918 it was composed of the Grand Aerie and 2,056 subordinate aeries; the total membership was more than 400,000. Since its organization it has disbursed \$17,500,000 in benefits.

Eakins, Thomas (1844-1916), American painter and sculptor, born in Philadelphia. He specialized in pictures of early American domestic life, scenes from American sports, negro characters, and portraits. His *Chess Players* is in the Metropolitan Museum of Art. He modelled the horses ridden by Grant and Lincoln on the Soldiers and Sailors Monument, Brooklyn, N. Y.

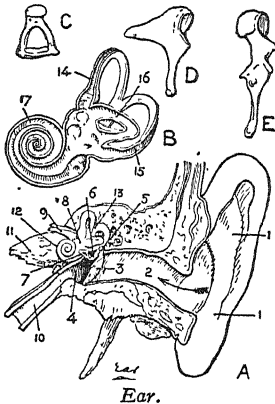
Ealing, town, Middlesex, England, a suburb of London. Marlborough, Fielding, and Byron lived here, and Thomas Huxley was born here; p. 61,235.

Eames, Emma (1867), American operatic soprano, was born in Shanghai, China, her father being an American lawyer resident there. In 1889 she made a triumphant *début* in Paris in *Romeo and Juliet*, after being rehearsed by Gounod himself, and two years later repeated her success in London and New York. She has since sung regularly in French, German, Italian, and English rôles in New York, London, and Madrid.

Eames, Wilberforce (1855-1937), American librarian and bibliographer, born Newark, N. J. He early devoted himself to the study of bibliography, in which he has won a prominent place. He has held posts as librarian in various important libraries.

Ear, a sense organ which subserves two distinct functions: it enables the organism to perceive vibrations ('hear') and to maintain equilibrium. Of these the second is probably the primitive function, and it is the one which predominates in at least the majority of invertebrates and in the lower vertebrates. In its simplest form the ear is a sac-like infolding of the skin (*ectoderm*), lined by sensory hairs, and containing solid particles—*ear stones* or *otoliths*—suspended in a fluid. As the organism moves, the ear stones affect now one and now another set of sense cells, and thus information of the direction of movement is conveyed to the nervous system, and equilibrium is consequently main-

tained. The ear stones must also be affected to a certain extent in all cases by vibrations propagated through the medium in which the animal exists. The chief modifications in form have reference to the position of the ear sac—*i.e.*, whether it retains its primitive connection with and opening to the surface, or whether it sinks inward and becomes a closed sac.



A. General view of ear in section: 1, outer ear; 2, external auditory meatus; 3, drum or tympanum; 4, cavity of tympanum; 5, malleus; 6, incus; 7, stapes; 8, labyrinth; 9, auditory nerves; 10, Eustachian tube; 11, apex of petrous bone; 12, cochlea; 13, semicircular canals. B. The bony labyrinth, section; 14, superior semicircular canal; 15, posterior canal; 16, exterior canal; 17, spiral tube of cochlea. C. Stapes. D. Incus. E. Malleus.

In fishes, only the internal ear is present. In amphibians, the acquisition of a terrestrial life has led to the specialization of an area of the skin to form a receptive drum or tympanum, which is separated from the internal ear by a space called the middle ear. This space communicates by a relatively wide opening with the throat, the opening being the homologue of a tube called the Eustachian tube in higher forms. A final complication is found in mammals, where we have added the external ear, forming a funnel which conveys the sound down the auditory passage to the drum. The apparatus of hearing, as it exists in man and the mammalia, is composed of three parts—the External Ear, the Middle Ear or Tympanum, and the Internal Ear or Labyrinth.

The *external ear* consists of two portions, the *auricle* or *pinna* (the part popularly recognized as the ear), and the *auditory canal* or *external meatus*. The auditory canal, the

outer end of which is visible, ends internally at the 'drum,' or *membrana tympani*, a stretched membrane on which the sound waves beat. This canal is protected by an abundance of ceruminous glands which furnish an adhesive yellow secretion, the *wax* or *cerumen*. The *middle ear* or *tympanum* is a cavity filled with air received through the Eustachian tube, and holding three small bones, which form the last link in the bone chain between the outer and the inner ear.

The *Eustachian tube* is a membranous canal, of very small diameter, and about $1\frac{1}{2}$ inches in length, which opens into the middle ear at one end, and into the back of the throat or pharynx at the other. It is partly osseous, but chiefly cartilaginous. Through it air reaches the tympanum, so that atmospheric pressure is kept equal on both sides of the drum. The *internal ear* or *labyrinth*, so called from its complicated formation communicates with the middle ear through the *fenestra ovalis* (oval window), which receives the foot plate of the last bone (stapes or stirrup) of the chain in the middle ear. The internal ear holds the end fibres of the auditory nerve, through which sensations of sound are carried to the brain (See NERVOUS SYSTEM).

Sound waves are carried by the auditory canal against the tympanic membrane. This vibrates, and its vibrations are communicated to the chain of bones in the middle ear, through which sensations are conveyed to the tiny endings of the auditory nerve in the internal ear, and thence to the auditory center in the brain. The semicircular canals hold serous fluid, and seem to be connected with the sense of equilibration or balance. The chief aural diseases arise from various forms of *inflammation* or *otitis*. (See OTITIS.)

An occasional and very serious complication of inflammation in the ear is an abscess in the mastoid cells, which are cavities in the bone behind the ear. (See MASTOIDITIS.)

Deafness, varying in degree from slight impairment of hearing to total inability to perceive sounds, may be due to a variety of causes. (SEE DEAFNESS.)

Earhart, Amelia (1899-1937), American aviatrix, born Atchison, Kan. In 1928 she flew with Stultz (pilot) and L. Gordon from Newfoundland to Wales, 2,000 miles, in 20 hrs. 40 mins., the first airplane crossing by a woman. She flew, solo, across the United States in the same year. In May, 1932, she made a solo flight from Newfoundland to Ireland in $13\frac{1}{2}$ hours, the first solo crossing since Lindbergh's historic feat. In January,

1935, she made the first solo flight across the Pacific, from Hawaii to California. The King of the Belgians decorated the aviatrix and Congress awarded her the Distinguished Flying Cross. She was lost in a flight east of New Guinea, July 1937. She was declared legally dead in 1939



Amelia Earhart.

Earl, an English title of nobility, next to a marquis and above a viscount (see NOBILITY). William the Conqueror, by making earldoms hereditary in England, probably took the first step to convert a title of office into one of dignity. The title of earl continued to be the highest hereditary dignity till Edward III. created his eldest son, Edward the Black Prince, *duke of Cornwall* (1337). See CORONET.

Earle, Alice Morse (1853-1911), American writer, was born in Worcester, Mass. She is known for her historical works dealing with the Colonial period: *Sabbath in Puritan New England* (1891); *Customs and Fashions in Old New England* (1893); *Home Life in Colonial Days* (1898); *Two Centuries of Costume in America* (1903), etc.

Earle, John (1824-1903), English philologist, was professor of Anglo-Saxon at Oxford from 1849, and did much to encourage the study of that language in England. He published: *Gloucester Fragments* (1861); *The Alfred Jewel* (1901), etc.

Earle, Mortimer Lamson (1864-1905), American classical scholar. In 1900 he became professor of classical philology at Barnard College, New York. His essays were collected in *Classical Papers of M. L. Earle, with a Memoir* (1912).

Earle, Pliny (1809-92), American psychiatrist. He was a founder of the American Medical Association. He devised new methods of treating the insane, especially in the direction of affording them amusements and occupations. He published: *Blood Letting in Mental Disorders* (1854); *Psychologic Medicine* (1867); *Psychopathic Hospital of the Future* (1867); *Curability of Insanity* (1877).

Earl Marshal, an English official who controls the Heralds' Office or the College of Arms. To this officer of state is also intrusted the duty of looking after all state functions.

Earle, George H. (1890-), became Governor of Pennsylvania in 1934, the first Democrat elected to that office since 1895. He was United States Minister to Austria, 1932-33. After service with the U. S. Army in Mexico in 1916, he enlisted in the Navy at America's entry into the World War and was given command of the submarine chaser Victor. For saving his vessel when it was endangered by fire he was awarded the Navy Cross.

Early, Jubal Anderson (1816-94), American soldier, a prominent Confederate general in the Civil War, was born in Franklin co., Va. For his services at the First Battle of Bull Run he was made a brigadier-general. He commanded a division at Fredericksburg, the right wing under Lee at Chancellorsville and as a major-general was conspicuous at Gettysburg. In July, 1864, Early drove back Gen. Sigel from Winchester, crossed the Potomac, defeated Gen. Lew Wallace on the Monocacy and was able to march within sight of Washington. In March, 1865, Early was defeated at Waynesborough, by General Custer, and was retired. He never took the oath of allegiance to the United States. He wrote *Memoir of the Last Year of the War* (1867).

Early English (also termed 'Christian Pointed'), the term applied to that form of Gothic architecture in which the pointed arch was first employed in Great Britain. Early English began in the 12th century. Early English architecture may be divided into two sub-periods. In the earlier period the doorway is deeply recessed and sculptured, but its later development is more ornate. An excellent example is the eastern part of Westminster Abbey and its chapter-house; also Salisbury Cathedral, which is of the Early English style almost throughout. The nave and transepts of Lincoln, the transepts of York, the nave and transepts of Wells, the west

front of Peterborough, and many other examples, prove the early part of the 12th century to have been one of unparalleled inspiration and splendid achievement.

Earn. (1) Loch, par. of Balquhider and Comrie, Perthshire, Scotland. At its s. extremity is the 'Darnlinvarach' of Scott's *Legend of Montrose*. (2) River, Perthshire.

Earnest. Earnest is given by the buyer to the seller to mark the final assent of both sides to a bargain. It may be in money or in kind (it was often a ring). It is found in use in Roman law in connection with contracts and later in the common law of England and in statutes. Earnest is forfeited upon breach of the contract.

Earring, an ornament, consisting of a plain ring or loop, to which a pendant is attached, suspended from the lobe of the ear, which is bored for the purpose. The early Egyptians designed beautiful and very costly earrings, the ring terminating in beasts' heads and kindred devices. In the classic epoch of Greece earrings were worn only by women, and consisted of pearls and precious stones.

Earth, The, the planet home of man, was for many ages popularly believed to be flat, long after Greek philosophers had proved that it was globular. Until about four centuries ago it was considered, even by the learned to be the center of the solar system and of the universe. Its rotation was understood in the 15th century, but the heliocentric theory is associated with Copernicus, who used it at the beginning of the 16th century to explain the movements of the heavenly bodies. Kepler (1571-1630), by means of laborious calculations, empirically discovered the laws of terrestrial motion; and Newton, in the *Principia* (1687), enunciated the universal laws of motion and gravitation.

Of the eight large planets, the earth is third nearest the sun, round which it moves in an elliptical orbit. Its distance from the sun averages 92,900,000 miles, and it is 3,000,000 miles nearer it at perihelion (January 1) than at aphelion (July 3). The length of its orbit is 584,000,000 m., and its mean velocity round it is 18.5 m. per second. The movements of the earth have given rise to two modes of measuring time. The period occupied by one revolution of the earth in its orbit is the measure of the year. The inclination of the earth's axis to the equator, and in a minor way, the variation in distance from the sun affect the intensity of heat received at different times of the year (see CLIM-

MATE), giving rise to the phenomena of the seasons. The earth rotates round an axis. The period occupied by one rotation is the measure of the day. The speed of rotation varies from zero at the poles to a maximum at the equator, where it is 1,037 m. per hour. In round numbers the diameter is 7,900 m., the circumference, 25,000 m., and the area of the surface, 197,000,000 sq. m.

The mass of the earth may be determined in several ways. The most important are as follows: (1) By comparing the force of attraction of a leaden ball of known mass, and at a known distance from a small ball, with the force of attraction of the earth for the same small ball. This is the Cavendish experiment. (2) By measuring the deflection of a plumb-line from the vertical owing to the attraction of a mountain. Newton first suggested this. (3) By comparing the periods of pendulums of equal length at the top and bottom of a mountain (Carlini, 1824) or of a mine (Airy, 1854). The mean specific density (or gravity) of the earth is obtained by comparing the mass (or weight) of the earth with that of an equal volume of pure water at 39° F.

Neither physical state nor the composition of the earth's mass is uniform. The atmosphere, which envelops all is mainly gaseous; the ocean, which fills the larger hollows of the surface, is liquid; the crust beneath is solid (see GEOMORPHOLOGY). Except in the ocean, the temperature steadily rises towards the interior. For theories of the earth's origin and future, see NEBULAR HYPOTHESIS. For measurement of dimensions, see GEODESY; for the outer crust, see GEOLOGY, GEOMORPHOLOGY, and GEODYNAMICS; for the oceans, OCEAN; for the atmosphere, ATMOSPHERE, METEOROLOGY, and CLIMATE; for distributions, GEOGRAPHY; for magnetic phenomena, MAGNETISM, TERRESTRIAL.

Earth Nut, a popular name applied to the tubers of various umbelliferous plants, known also as pignuts or earth chestnuts, the latter from a fancied resemblance in taste to chestnuts.

Earth Pillar, a column of earth on the apex of which a large boulder is frequently perched. Fine examples are to be seen at Botzen, in the Tyrol, and in the 'Garden of the Gods' in Colorado. They are from 30 to 100 ft. in height, and taper upwards. They are produced by the action of rain on a mass of soft, stony clay.

Earthquakes. An earthquake is the shaking of part of the earth's crust due to natural

subterranean causes. The vibrations of an earthquake may be so slight that they can be detected only by the most sensitive instruments; they may be so strong that buildings are wrecked, cracks are opened in alluvial ground, large landslides fall from the sides of cliffs, and even cities are destroyed. The vibrations are naturally strongest near the origin of the shock, dying out gradually at increasing distances. The Lisbon earthquake of 1755, the most famous earthquake of history seems to have been noticeable at a distance of about 1,400 m. from the point of origin, and over an area of about one-thirtieth of the earth's surface, more than half this area being under the ocean. An earthquake that is felt at one quarter that distance is a very severe one. Earthquakes are now divided into three classes:

(a) Those due to the shock of falling rocks, usually from the roofs of caverns. The Pamir earthquake of Feb. 18, 1911, is the only known earthquake of any magnitude which may have been due to the downfall of rock.

(b) Volcanic earthquakes. Slight shocks accompany all great volcanic outbursts; these are not felt, however, except in the immediate vicinity of the volcano. The great explosion of Krakatoa in 1883, was not felt at Batavia, 100 m. distant; nor was the eruption of Mt. Pelee in 1902 even recorded on the seismograph at Trinidad, 300 m. to the s.

(c) Tectonic earthquakes, due to fractures of the rock. These include all great earthquakes (and practically all lesser ones), except possibly that mentioned under (a) above. Fractures of this kind are well known to geologists and are called *faults*; they occur widely over the earth. The movements may be vertical or horizontal; indeed, in any direction parallel with the surface of the fault. The fault involved in the California earthquake, 1906, is known as the San Andreas fault; the movement at the time of the earthquake was practically horizontal. Many movements had taken place on this fault in earlier times. Accurate surveys by the U. S. Coast and Geodetic Survey before and after the earthquake showed that the region w. of the fault had, in the course of 50 years, moved to the n., relative to the eastern side, a distance of about 10 ft., thus causing a fracture. This is the *elastic rebound* theory of earthquakes which may be stated succinctly as follows:

1. The fracture of the rock which causes a tectonic earthquake is the result of elastic strains, greater than the strength of the rock

can withstand, produced by the relative displacements of neighboring portions of the earth's crust.

2. These relative displacements are not produced suddenly at the time of the fracture, but attain their maximum gradually during a greater or less period of time.

3. The only mass movements that occur at the time of the earthquake are the sudden elastic rebounds of the sides of the fracture towards positions of no elastic strain; these movements extend only a few miles from the fracture.

4. The earthquake vibrations originate in the surface of the fracture; the surface from which they start has at first a very small area, which may quickly become large, but at a rate not greater than the velocity of compressional elastic waves in the rock.

5. The energy liberated at the time of an earthquake existed immediately before the rupture in the form of elastic strain of the rock.

Faults are known in all parts of the world. In some cases the displacements amount to thousands of feet and even to miles. These great displacements could not have taken place at one step, but must be the effect of many successive steps, and each step must have caused an earthquake. All that can be said definitely is that movements do occur in the earth's crust and that they are due to some obscure subterranean forces.

Great earthquakes are never limited to a single shock. There is usually one strong shock, lasting from half a minute to a minute, followed by a series of so-called aftershocks, which continue for months or even years. They are very frequent at first but gradually and irregularly become less violent and less frequent, and finally die out; fairly strong shocks are often interspersed. The Virgin Islands earthquake of 1867 was followed by aftershocks so frequent for twelve hours that they could not be separated; it was six months before they ceased. After the severe Mino-Owari (Japan) earthquake of 1891, 3,364 aftershocks were recorded at the Gifu observatory in two years.

The region over which the earthquake is strongly felt is called the megaseismic region. The phenomena observed may be divided into two classes: primary and secondary. The primary include the slow movements of the crust resulting in the fracture; the sudden elastic rebound of the sides; the formation of fault scarps, or the elevation or depression

of shore lines, when the displacement is partially vertical; the rupture and offset of pipes, fences, roads, etc. The secondary phenomena include all effects due to the vibrations. In many cases the fracture does not extend to the surface and the primary phenomena are absent or indistinguishable, as happened in the Charleston earthquake of 1886. The solid rock in that region is covered by a thick mantle of clays and sands, which suffered much disturbance, but the fault was not visible at the surface. Secondary phenomena are due to the vibrations. According to the violence of the earthquake, there may be merely a slight shaking, or objects may be thrown from shelves, furniture may be moved, chimneys broken or thrown down, cracks developed in walls, or houses completely demolished. The overthrow of lamps and stoves often starts a conflagration which cannot be controlled, especially if the water pipes are broken and the water supply cut off, as in San Francisco in 1906 and in Tokyo and Yokohama in 1923.

Surface waves resembling water waves have been seen at the time of nearly all great shocks. They occur on alluvial soil and only when the earthquake is very violent. They have been called 'gravity waves.' The range of the vibrations of a moderate earthquake is a fraction of an inch; near the origin of severe earthquakes it may rise to 6 inches or so, but dies out rapidly with increasing distance from the point of origin. In the megaseismic area the vibrations have many periods, from a small fraction of a second up to several seconds. If they are sufficiently rapid, they give rise to low-pitched sounds, which appear to come from all sides. At the distance where the earthquake is only slightly felt, the rapid vibrations have been damped out and only the slow ones persist, frequently causing a feeling of nausea.

Experience and the characteristic movements due to an earthquake indicate the precautions necessary for protection. A house should not be built close to an active fault, which can generally be recognized by geologists. Experience, experiment, and theory all show that the vibrations are stronger on alluvium than on rock; hence, when possible a foundation on rock should be chosen. When it is not practicable to follow these rules, the house should be built so that it yields to the movements without collapsing, or should be so strong that its walls will not be broken. Wooden houses, well braced and with the parts well tied together, resist damage well, as do also buildings of reinforced concrete. It

sometimes happens that seismographs record for hours and even for days small vibrations of the ground with periods from five to nine seconds and amplitudes of a few thousandths mm. These microcosms have been ascribed to the waves of the sea beating on the shore, to the wind, to the barometric gradient, etc., but their true cause has not yet been ascertained.

Many earthquakes have their origin under the sea. There is no reason to believe that these differ from earthquakes on land except in their secondary phenomena. When the vibrations pass from the underlying bed rock to the water they give rise to compressional waves similar to sound waves. These are propagated with great velocity, nearly a mile a second, and ships struck by them shudder as though they had struck bottom. The most disastrous effects of submarine earthquakes, however, are the great sea waves that frequently follow them. When these waves reach the coast they may be 20 or 30 ft. high, or even higher. Except very near the point of origin these waves are not noticed at sea. An earthquake off the coast of Japan in 1896 produced enormous waves which ravaged the coast over a length of 700 m., and drowned 30,000 people; but fishermen in their boats knew nothing of it until they returned home to find the land devastated.

The amount of energy radiating from a strong earthquake is enormous. The energy liberated by the California earthquake has been estimated at 130,000 trillion foot-pounds. The desire to learn more accurately the nature of earthquake movements than could be determined by the senses, led to the invention of instruments called seismographs. A seismograph consists of a heavy mass mounted so that, if disturbed, it will swing slowly about a position of equilibrium. There are several forms. The simplest is an ordinary pendulum, much used in Italy, but this swings too rapidly unless inordinately long. A second form is the inverted pendulum, a heavy mass balanced on a point and kept vertical by springs; it has given very good records. The form in most general use is the so-called horizontal pendulum.

When a train of earthwaves arrives at a station, the pendulum is set in vibration with the same period as the waves. The instruments above record the horizontal component of the motion only. Another form has been devised to record the vertical component. It consists of a horizontal bar with a weight at one end and pivoted at the other, so that it

can swing in a vertical plane. It is held in a horizontal position by a vertical spring; the natural period can be lengthened by attaching the spring at a point below the general line or bar. Its general action is like that of instruments recording horizontal movements.

The record, which is usually called a seismogram, is made on a rotating drum, which may be covered with smoked paper, on which the point of the magnifying lever scratches the record. Time marks are made on the drum every minute, so that the exact time of arrival of a disturbance and the period of the waves, may be determined. Instruments have not proved very successful in the megaseismic region because the violence of the disturbance throws them out of commission, but they are very successful at distant stations. They have enabled us to construct the transmission curve, and to study the character of the vibrations. They enable us to determine the place of origin and the time of occurrence of earthquakes under the sea or in uncivilized regions, even when no other information is available. The magnifying power of seismographs is usually somewhere between 25 and 100 times, but some run as high as 1000. The movements recorded are often so extremely small that the unit used to express them is $1/1000$ mm. or $1/25000$ in.

The focus may be some m. below the earth's surface, and the region immediately above it at the surface is called the epicenter.

As earthquakes are so closely related to geologic activity, it is probable that the focus is rarely as much as a score of m. below the surface. The more deep-seated the focus, the more slowly will the distance from it and, therefore, the intensity of the shock, decline with increasing distance from the epicenter. If the focus were at the center of the earth, all parts of the surface would be equally affected. Experience shows that the intensity declines rapidly with distance from the epicenter; and therefore the focus must be shallow. Sometimes it is actually at the surface. Times observations are not yet sufficiently accurate to make a good determination of this depth, if it is small. It is not impossible that some earthquakes may originate at great depths and not be felt anywhere at the surface, the disturbance being recorded only by seismographs. This problem is now under investigation.

By plotting the locations of nearly 160,000 earthquakes, Dr. Montessus de Ballore discovered that nearly 95 per cent. occurred in two great zones, one surrounding the Pacific

Ocean, and the other passing through the Mediterranean, the Caucasus, the Himalayas, the East Indies, and the West Indies. These zones correspond to the region of great deposits of sediments in the Mesozoic Age; in places these sediments, solidified into rock, have been raised to form the great mountain ranges now existing. The same observer and Milne have pointed out that many of the great catastrophes occur on the great slopes of the world. This seems due not to the breaking down of these slopes, but rather to their continued development; for they are regions of great faults, so recent that there has not been time for their degradation by erosion. Earthquake regions are regions of active geological movements. Milne has estimated that 30,000 earthquakes occur annually, and about 50 can be recorded by seismographs all over the world. Many general or local catalogues of earthquakes have been compiled, the greatest being that of Montessus de Ballore (not published) listing over 177,000 shocks. The lists are very incomplete, especially for early historic times, for uncivilized countries and for oceanic areas. Seismographs are now so widely distributed that few shocks, even of moderate intensity, can escape record.

It is easy to predict the regions where strong earthquakes are apt to occur by the simple formula that where earthquakes have occurred they are pretty sure to occur again.

The *Lisbon Earthquake*, which occurred on Nov. 1, 1755, is the most notable earthquake of history. There were two violent shocks a little before 10 A. M. and a third about mid-day. The air became filled with dust from the falling houses, and fires were started. Soon after the earlier shocks the sea withdrew from the shore and then rushed back in three large waves, from 15 to 20 ft. high, completing the destruction and drowning many people. The earthquake was undoubtedly due to movement on a submarine fault opposite the southwestern part of Spain. It made a profound impression on the civilized world, and was generally looked upon as a divine castigation.

THE NEW MADRID EARTHQUAKES are the heaviest shocks that have been recorded in North America. They occurred on Dec. 1, 1811, Jan. 26, and Feb. 7, 1812, with many lighter shocks between and after these dates. The origin was in the alluvial basin of the Mississippi, centering near the southeastern corner of Missouri. The shocks were felt as far as Boston, 1,100 m. distant. Over an area 100 m. long in a northwesterly-south

easterly direction and 50 m. wide, the alluvial was in some places raised, in some depressed, forming ridges, domes, and lakes; cracks opened in the ground and landslides fell from the river bluffs; and the whole surface of the country was altered; the region is still called 'the sunken country.' The current in the river is said to have actually been reversed for a short time, and at one place an elevation across the river developed a waterfall several ft. high. The loss of life and property was very small.

stroyed all the towns within many m. of Tokyo; 300,000 people were reported killed and the property loss has been estimated at a billion dollars. The earthquake seems to be due to movement on a fault near Yokohama; the fault being partly on land and partly under the water; therefore a great water wave added to the destruction. Fire added to the horror.

In December, 1932, 70,000 people in Kansu Province, China, lost their lives from a severe earthquake and the floods which followed it



Kamaishi, Japan. Effect of Earthquake followed by Tidal Wave.

The CALIFORNIA EARTHQUAKE began at 5:12 A. M. April 18, 1906, and 30 seconds later came the strongest shock. Many walls were cracked or thrown down over the western central part of the State, and fires were started. The water supply system of San Francisco was so injured that water could not be obtained and the fire raged there several days. The movement on the San Andreas fault, responsible for this earthquake, has been described. The loss of life was not great, 500; due probably to the fact that most of the residences were frame. The loss of property was about 500 million dollars, to be divided in an unknown proportion between the earthquake and the fire. (See SAN FRANCISCO.)

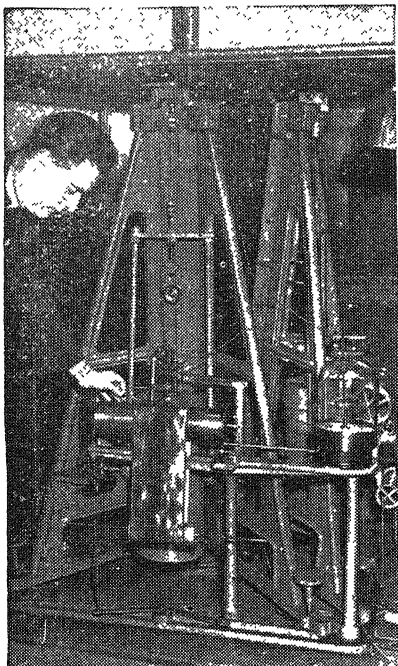
The JAPANESE EARTHQUAKE, the greatest earthquake disaster of modern times, took place at midday Sept. 1, 1923, and de-

In March, 1933, shocks, followed by sea waves, caused great damage in the northern part of the Island of Hondo, Japan, and nearby islands. In 1939 a shock in Chile killed about 50,000 and left ten times that number homeless. In the same year Turkey suffered an earthquake which slew 20,000 and destroyed the habitations of more than 100,000 persons. In 1940 Rumania sustained a severe shock centered in its important oil fields causing great damage and loss of life.

The most comprehensive and satisfactory books on earthquakes are Dr. Montessus de Ballore's *Tremblements de terre* and *La science sismologique*. Milne's *Earthquakes* and *Seismology* are still good. Other works are: Davison's *A Study of Recent Earthquakes* and *A Manual of Earthquakes* (1921); *Report on the California Earthquake* (1908-1910) by Lawson and others.

Earths, the name applied by the alchemists to certain substances now known to be oxides of metals.

Earth-shine, a faint illumination of the dark part of the moon by light reflected from the earth. The appearance known as that of 'the old moon in the new moon's arms' is a phenomenon of irradiation.



Seismograph, at Georgetown University.

Earthwork is the term applied in engineering to the removal of the earth structure from one place to another. Strictly speaking, it is applied only to the granular earthy materials, such as clay, sand, gravel, or loam; but the term broadly includes the removal of rock, when that has to be reduced to small pieces for the purposes of removal or of subsequent filling.

Earthwork operations are separated into two parts—(1) the removal of the earth, that is, the excavation or cut, and (2) the placing of the earth, that is, the fill or embankment. These are the fundamental operations in all engineering construction, but they are of most importance in railway and canal work.

The simplest method of excavation is that in which men loosen the earth with picks and

shovel it into wheelbarrows, carts, or wagons, which take it to the place of deposition. The next step is the use of the horse-drawn scraper, a heavy metal scoop of varying design which is dragged along the ground to be excavated until it is filled, when it is drawn to the dump or cart. The most advanced form of excavation is by power machines, such as steam shovels, drag scrapers, etc. (see EXCAVATION), which dump into trains of cars or cableway buckets. Great impetus has been given recently to the use of dynamite in excavation, particularly for drainage ditches. Hydraulic Excavation is a method of excavating which owes its origin to the California gold miner, and is chiefly practised in the United States. The measurement of the amount of earth excavated or filled is a fairly complex operation, always performed by the engineer on construction work. The amounts so obtained are used as a basis of payment to the contractor for the work done. Payment for earthwork is made for different kinds of material, classified by previous agreement, generally as earth, loose rock, and hard rock, though more or less strict classifications are occasionally decided upon.

Special note should be made of the tremendous advance given in the mechanical cutting, loading and hauling of excavated material in the past year or two. Belt conveyors and bucket loaders have combined with refinements in motive power for industrial haulage to eliminate more than half the man-power previously required in earth moving operations.

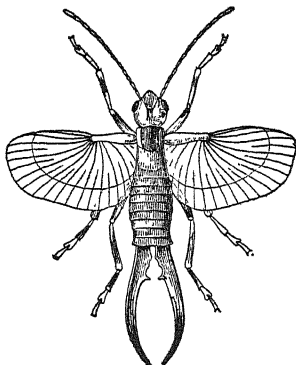
Earthworm, a genus of bristle-footed or chaetopod 'worms,' in the section Oligochaeta, where the bristles are few compared with those of related marine types. Several species, especially *L. terrestris* or *agricola* and *L. communis*, are very familiar.

The ringed body, the iridescent cuticle, the segment overhanging the mouth, the swollen glandular 'girdle,' or *clitellum*, the four double rows of tiny bristles, eight for each ring, are familiar external characters. The food consists of earth removed in burrowing, from which the earthworm extracts the organic matter, and also of leaves and other vegetable substances. Earthworms have strong claims to be ranked as most beneficial animals. In the long past they have made a great portion of our most valuable soil, and now they are improving and renewing it without ceasing. They burrow and open the way alike for the rain drops and the plant roots; they bruise the soil particles in their grizzard mills, and

liberate the mineral elements. The importance of their humble labor is inestimable. Darwin showed that there are on an average over 53,000 worms in an acre of garden; that ten tons of soil per acre pass annually through the bodies of the inhabitants; and that they bring up mould from below at the rate of 3 inches of thickness in fifteen years.

Consult Darwin's *The Formation of Vegetable Mould Through the Action of Worms*; Beddard's *Monograph of the Order Oligochaeta*, and *Earthworms and Their Allies* (1912).

Ear Trumpets, contrivances for assisting the partially deaf to hear by concentrating and re-enforcing sounds, and conducting them to the auditory canal. Trumpets are of benefit only in cases of deafness resulting from diseases of the middle and external ear. They are used chiefly for hearing at a distance, the ear tube, many smaller devices, or electrical instruments being preferred for purposes of conversation.



Earwig with Wings Extended.
(Twice natural size.)

Earwig, a well-known genus of the orthopterous insects, ranked in the order Dermaptera. They are best known in Europe, but several species occur in the Southern United States, where they do much damage to fruit. Earwigs avoid the light, and do most of their work in the dark. They feed on petals and other parts of flowers, on fruit, seeds, and leaves.

Easel, the wooden stand on which painters place pictures while at work upon them.

Easement, in the widest sense, may be defined as any legal right possessed by one person over the property of another. Easements may be either appurtenant, or appendant, or

in gross. The former are such as adhere to certain lands or tenements for the benefit of the owner for the time being; the latter are such as are purely personal to an individual.

In Roman law, easements were called servitudes, and the terms 'dominant tenement' and 'servient tenement' found in that system were commonly used by lawyers both in England and the United States to describe the property for the benefit of, and against which, respectively, an easement appurtenant exists. Common examples of easements are rights of way, rights of support, air, light, etc.

An easement can be constituted only by grant, express or implied. Easements are either Positive or Negative. That is to say, the party benefited may be entitled either to do something which would otherwise be illegal—e. g., to walk over another's land—or to prevent the party bound from exercising what would otherwise be his legal right—e. g., from building on his own land in such a way as to obstruct the light of the party benefited. Easements may come to an end by merger; or by a formal renunciation of deed; or by failure to exercise the right for a lengthy period; or by necessity, when a change of circumstances renders the easement inoperative. Consult Jones' *Law of Easements*.

East is, popularly, that quarter of the horizon in which the sun rises, though it is only at the equinoxes that the sun rises exactly in the eastern point. A line at right angles to the meridian of a place points exactly east and west. From very early times the east has been invested with a certain sacred character, and it was the practice of many ancient pagans to fix their altars in the eastward part of their temples, so that they might sacrifice toward the rising sun.

The custom of praying toward the e. was adopted by the early Christian Church from at least the 2nd century, as a symbol of Christ as the 'Sun of Righteousness,' the 'Dayspring from on High,' and the 'Morning Star.' The Anglican Church, which has an Eastern tradition, as a rule orients all its sacred buildings.

East, Sir Alfred (1849-1913), English landscape painter and etcher, was born in Kettering, Northamptonshire. Some of his best pictures are *A Passing Storm* (Luxembourg, Paris); *The Silent Somme and Autumn* (Manchester); *Gibraltar* (Liverpool).

East Aurora, village, New York. The famous Roycroft Shops are located here. See ROYCRÖFT; p. 5253.

Eastbourne, seaside resort, England, on

the coast of East Sussex, England. Handsome promenades extend along the sea front for about three miles, with a cliff drive above on the west; p. 62,030.

East Cape. (1) The most easterly headland of the North Island of New Zealand. (2) The most easterly point of Madagascar. (3) The southeastern extremity of New Guinea on Goschen Strait.

cated the summer estate of the late John D. Rockefeller; P. 39,395.

Easter, the festival of the Resurrection of Jesus Christ, probably derives its name from Eastre, a Saxon goddess whose festival was annually kept about the same time as Easter. In the ancient church, the celebration of Easter lasted eight days. After the 11th century, however, it was limited to three, and



Photo by Underwood & Underwood.

Japanese Earthquake, showing cracks in the Earth.

Eastcheap, formerly an open market place in London, the junction of several important highways at the n. end of London Bridge.

East Chicago, city, Indiana, Lake co., on Lake Michigan; is commercially a part of Chicago, is a port for Lake Michigan steamers, and has iron and steel works, foundries and manufactures of lumber, boilers, and hay presses; p. 54,637.

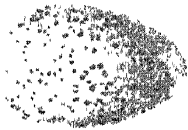
East Cleveland, city, Ohio, an eastern residential suburb of Cleveland. Here is lo-

in later times generally to two days. It was formerly the favorite time for performing the rite of baptism. During the week before Easter, daily services were held. On Easter Day the people saluted each other with the Easter kiss, and the exclamation *Surrexit* ('He is risen'); a custom still retained in the Greek Church. The chief solemnity has always consisted of the celebration of the Lord's Supper; and Easter is the one time in the year at which, by the Fourth Lateran

EGGS OF AMERICAN BIRDS

PLATE I

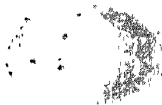
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|----------------------------|-----------------------------|
| 1. CEDAR WAXWING | 13. PARULA WARBLER |
| 2. RED-EYED VIREO | 14. MAGNOLIA WARBLER |
| 3. WHITE-EYED VIREO | 15. YELLOW WARBLER |
| 4. WARBLING VIREO | 16. WATER RUSH |
| 5. PHAINOPEPLA | 17. YELLOW-THROATED WARBLER |
| 6. BLUE-HEADED VIREO | 18. PRAIRIE WARBLER |
| 7. BELLS VIREO | 19. MARYLAND YELLOW THROAT |
| 8. BLACK AND WHITE WARBLER | 20. OVEN BIRD |
| 9. PROTHONOTARY WARBLER | 21. YELLOW-BREADED CHAT |
| 10. WORM-EATING WARBLER | 22. CHESTNUT-SIDED WARBLER |
| 11. BLUE-WINGED WARBLER | 23. HOODED WARBLER |
| 12. ORANGE-CROWNED WARBLER | 24. REDSTART |
| | 25. PIPIT |



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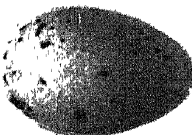
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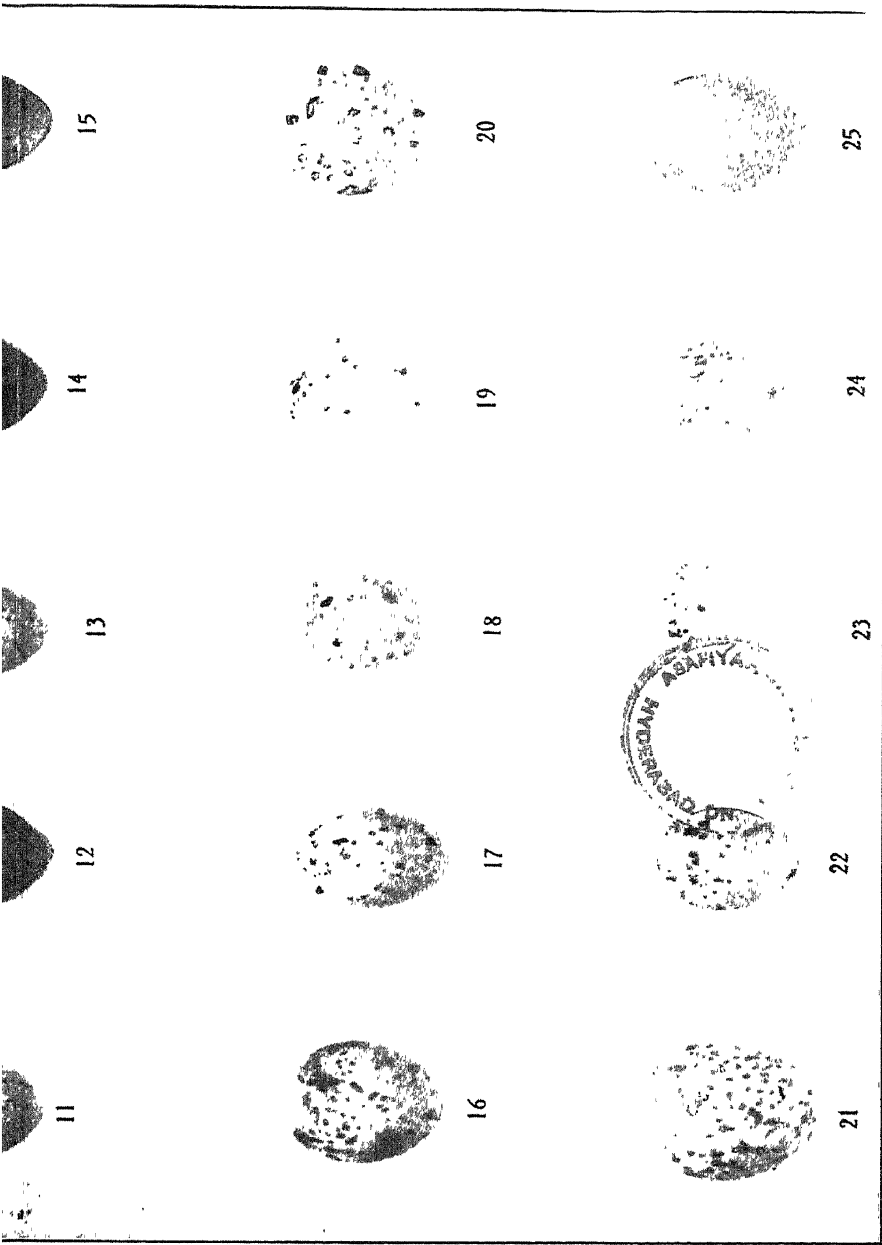


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EGGS OF AMERICAN BIRDS (PLATE I)

Council, Roman Catholics must receive communion.

Many of the popular observances connected with Easter are clearly of pagan origin. The worship of the Saxon deity 'Eastre,' introduced into England by the Saxons, continued to be celebrated in many parts of the n. of Germany down to the beginning of the 19th century, by the kindling of bonfires and numerous other rites. The bonfires can be traced in the great 'paschal tapers,' or 'Easter candles,' sometimes weighing 300 pounds, with which the churches were lighted on Easter Eve. One of the most popular features of Easter was the Pasch or Easter egg, an old emblem of the Resurrection. In Germany, instead of the Easter egg, is presented an emblematical print, in which three hens are holding a basket wherein are three eggs. Formerly in England the Easter egg was blessed by the priest, and being elaborately colored, was often kept as an amulet.

The proper time for the celebration of Easter has occasioned no little controversy. In the 2d century a dispute arose on this point between the Eastern and Western Churches. The Council of Nice, 325 A.D., decided in favor of the Western usage. The controversy as to the celebration of Easter in England was settled by the adoption of the Roman usage at the Council of Whitby in 664. It was on the metonic cycle that the Gregorian Calendar, introduced in 1582, was arranged. The Gregorian Calendar was adopted by the Greek churches and by Russia in 1923, so that these churches now celebrate Easter and other holy days in conjunction with other Christian bodies.

Easter Islands, or **Rapa Nui**, in the Southwestern Pacific; so-called because discovered on Easter Day, by the Dutch admiral Roggeveen; was annexed by the Spanish admiral Gonzales in 1770; and now belongs to Chile. The population is about 150. The natives are Malayo-Polynesians.

The particular interest which attaches to the islands is dual: they are the richest site of the megaliths—huge stone prehistoric monuments—in the Pacific; they are also, a rare source of incised hyloglyphs—small pieces of wood covered with finely incised hieroglyphic inscriptions. Consult *Reports of the U. S. National Museum* (1891, 1899); Dalton's *Man* (vol. iv.); C. R. Enock's *The Secret of the Pacific* (1912).

Eastern Bengal and Assam, a former political division of British India, in existence from October, 1905, to April, 1912.

Eastern Question, **Near**, was the name commonly given to the problem of disposing of the territories of the Sultan, when, as was confidently predicted during the 19th century, Turkey should cease to exist as an Empire. Involved in the question were the problems of the independence of the Balkan States, the control of Constantinople and the Straits, the rivalry of the Great Powers for domination of the routes to the East, and the future of the Turkish people.

The Eastern Question, in the traditional sense, was answered by the Great War, the peace treaties, the mandates under the League of Nations, and the Greco-Turkish war of 1921-22. Problems following the last-named war were settled in 1930, when a compact between Greece and Turkey was made, confirming the status quo in the Eastern Mediterranean and liquidating exchange of populations between the two countries. However, trouble between the Arabs and the Jews in Palestine, Italy's seizure of Albania, Germany's appetite for eastern expansion, Bulgaria's desire to recover territory relinquished to Roumania, Yugoslavia and Greece, and Hungary's ambition to re-annex her former lands taken by Roumania, indicate that conditions continue to seethe, and that finality to this question seems impossible. See EUROPE, GREAT WAR OF; the *History of EUROPE, TURKEY; BALKAN PENINSULA and BALKAN WARS; MACEDONIA, CRETE*, and the various Balkan States.

Eastern Roumelia. See **Bulgaria**.

Eastern Star, **Order of**, a fraternal society, organized in 1876, affiliated with the Masonic order, and to which only master Masons and their women relatives may belong.

East Flanders, province of Belgium, bounded on the n. by the Netherlands, and drained by the Scheldt and the Lys. Linen, cotton, and woolen manufacturing, flax spinning, and paper making are important industries; p. 1,109,349.

East Greenwich, village, Rhode Island, county seat of Kent co., on Greenwich Bay, an arm of Narragansett Bay, has manufactures of cotton, worsteds, yarn, and dextrin, and chemical and bleaching works. East Greenwich Academy is situated here; p. 3,842.

Easthampton, tn, Massachusetts, Hampshire co.; the seat of Williston Seminary. Easthampton was settled in 1665, and was the scene of a massacre by the Indians (May

13, 1704), in which nineteen lives were lost; p. 10,316

East Humboldt Mountains stretch from n. to s. of Elko co., Nevada.

East India Company, the name given to several trading companies granted a monopoly of the East Indian Trade by their respective governments. The earliest incorporated East India Company was the English, to which Queen Elizabeth granted a charter on the last day of the 16th century. The term 'East Indies,' as used in the charter, comprised India, Sumatra, Java, and other islands in the Eastern Archipelago, but in 1622 the Dutch ousted the British from the Eastern Archipelago, and thenceforth the British company concentrated its energies on India. Between 1661 and 1683 Charles II. granted the company no less than five charters of importance. The Dutch war of 1665-7, terminating in the Treaty of Breda, eliminated the Dutch from India, and the struggle with France, 1745-61, at length ended French dominion in India, leaving the British East India Company master of the field and giving to it a monopoly of the Far Eastern trade, in China as well as in India.

In 1773 an Act of Parliament centralized the administration of all provinces the company had acquired in the hands of a governor-general, and brought its civil and military affairs under the review of a British cabinet. From that time each renewal of its charter increased the restrictions on its privileges. On Nov. 1, 1858, the government of India passed to the crown, and the East India Company ceased to exist. See *INDIA, History*. Consult J. Bruce's *Annals of the East India Company*; F. P. Robinson's *Trade of the East India Company from 1709 to 1813* (1912).

The Dutch East India Company was chartered in March, 1602, with a monopoly of Dutch trade with the Indies. Its era of prosperity was the 17th century, when it founded Batavia in Java, 1619, took Ceylon and Malacca from Portugal, established itself at the Cape of Good Hope, 1652, and made a treaty with the princes of Sumatra, 1667. In the 18th century it steadily declined, and was dissolved, 1798. Consult Clive Day's *The Dutch in Java* (1904).

The French East Indian Company, founded by Cardinal Richelieu, 1642, and reconstructed under Colbert, 1664, sent an expedition to Madagascar, 1664, and established a French factory at Surat, 1667. In 1674 it was driven from Saint Thomé by the Dutch, and retired to Pondicherry, 1674. Its only

prosperous period was during the governorship of Dupleix, that began in 1741. In 1770 its property was ceded to the state.

East Indies, or Malay Archipelago, the double chain of islands which extend from the s.e. corner of Asia to the northern extremity of Australia. On the Pacific side there are the islands of Borneo, Celebes, Buton, Sula Islands, Buru, Morotai, Jilolo, Amboyna, Ceram, Banda, Waigeu, Misol, Salwati, and New Guinea. The Sulu Islands and the Philippines are a northward extension of this chain, the connecting links being the Sangir and Talaut groups of islands. Next the Indian Ocean the southern chain includes Sumatra, Riouw-Lingga, Banca, Billiton, Java, Madura, Bali, Lombok, Sumbawa, Sandalwood, Flores, Timor, and the Tenimber, Kei, and Aru groups. All these belong to the Netherlands except the Philippines and Sulus, the northern part of Borneo, the eastern half of Timor, and the eastern portions of New Guinea. The inhabitants are largely of the Malay race; though Chinese, Arabs, indigenous tribes, and Europeans are present.

Authentic history of the East Indies begins in 1509 with the Portuguese explorers, who were followed by the Spanish, English and Dutch. Except for a brief period of English rule in 1811-16, the Dutch have been the controlling political power in the archipelago. Consult Kennedy's *The Ageless Indies* (1942). See **DUTCH EAST INDIES**; **EAST INDIA COMPANY**. Also see under the separate islands.

Eastlake, Sir Charles Lock (1793-1865), English painter, was born in Plymouth. Among his works are: *The Spartan Isadas* (1827); *Christ Weeping Over Jerusalem*, (1841). He published *Materials for a History of Oil Painting* (1847), and a translation of Goethe's *Theory of Colors* (1840).

Eastland Disaster, a disaster occurring on July 24, 1915, when the steamer *Eastland* sank at the dock in the Chicago River with a loss of 82 lives.

East Liverpool, city, Ohio, Columbiana co. The city is one of the important pottery centres of the country, having 39 potteries making general ware and electrical porcelain. It is conspicuous for 300 bottle kilns projecting above the factories. East Liverpool claims to have been the first community in the world to pipe natural gas for fuel and lighting purposes; p. 23,106.

East London, seaport town, South Africa, in the Province of the Cape of Good Hope; p. 48,800.

East Main, a bleak, rocky, and scantily

peopled portion of the Labrador peninsula

Eastman, Charles Alexander, Ohiyesa (1858-1939), American physician and author, was born in Redwood Falls, Minn., of Sioux Indian parentage. He wrote *Indian Boyhood* (1902); *The Soul of the Indian* (1911); *Indian Child Life* (1913); *Indian Heroes and Great Chieftains* (1918).

Eastman, George (1854-1932), American inventor, born in Waterville, N. Y. He was a notable philanthropist, and during his lifetime donated about \$75,000,000 to philanthropic and educational objects. In 1880 he devised a process for making dry plates and invented the first plate-coating machine. In 1884 he produced a successful rollable film and developed the camera into what became known as the 'Kodak.' In 1890 he perfected a machine for making transparent film rolls. He simplified the process of developing and printing photographic films, and organized the great Eastman Kodak Company which commands a world-wide market. He committed suicide in Rochester, N. Y., leaving a brief note 'To my friends: My work is done. Why wait? G. E.'

Eastman, John Robie (1836-1913), American astronomer and mathematician, was born in Andover, N. H. He made various special astronomical observations in the United States and Europe; and most of his published work is found in the reports of the Government Observatory. He is the author of *Transit Circle Observations of the Sun, Moon, Planets, and Comets* (1903).

Eastman, Joseph Bartlett (1882-1944), public official, was born in Ketonah, N. Y. Upon leaving Amherst College, in 1904, he engaged in service at South End House, Boston. For 8 years he acted as Secretary of the Public Franchise League of Boston, following which he served as a member of the Mass. Public Service Commission. In 1915 he was appointed a member of the Interstate Commerce Commission and in 1933 became Federal Coordinator of Transportation.

Eastman, Mary Henderson (1817-80), American author. Her books include: *Dacotah* (1849); *Romance of Indian Life* (1852); *Tales of Fashionable Life* (1856).

Easton, city, Pennsylvania, county seat of Northampton co. Lafayette College is located here. Easton has an abundant supply of good water, and the vicinity is rich in mineral deposits. Among its manufactures are castings, refrigerator hardware, agricultural implements and vehicles; p. 33,509.

East Orange, city, New Jersey, Essex co.; an attractive residential suburb of New York City. Manufactures include bread, electrical apparatus, and pharmaceutical supplies, p. 68,945.

East Pittsburgh, borough, Pennsylvania, Allegheny co. The Westinghouse Electrical Works are located here. In 1755 the French and Indians defeated General Braddock's army at this place; p. 6,079.

East Providence, town, Rhode Island, Providence co., on Narragansett Bay. Industries include chemical and wire works, a shoe-string factory, and oyster trade, p. 32,165.

East River, a tidal channel connecting Long Island Sound with New York Bay, and separating Long Island from Manhattan Island and the borough of the Bronx. Its length is about 15 m. It is crossed by four great suspension bridges and a number of tunnels pass beneath it to Brooklyn and Long Island City. In the East River are Blackwell's, Ward's, Randall's, and other islands, on which are various city institutions

East Rutherford, borough, New Jersey, Bergen co. Mirrors, boilers, silk and surgical instruments are manufactured, and there are bleaching works; p. 7,268.

East Saginaw. See **Saginaw**.

East St. Louis, City, Illinois, St. Clair co., on the Mississippi River, opposite St. Louis, Mo., with which it is connected by steel bridges. Its industries include grist, flour, machine shops, steel and chemical works, paper mills, and slaughtering and meat-packing plants. Just outside the city limits are the National Stock Yards, one of the largest horse and mule markets in the world; p. 75,609.

East Stroudsburg, borough, Pennsylvania, Monroe co. It is the seat of a State normal school. Boilers, glass, silk, hosiery, brass, and piano stools are manufactured; p. 6,404.

Eaton, Charles Warren (1857-1937), American artist, born in Albany, N. Y. Among his more important canvases are *Song of the Pines* (1909), *Among the Dunes* (1912), *Whispering Pines* (1922), *Berkshire Valley* (1924), *Grey Silence* (1929), *Green Mansions* (1933).

Eaton, Dorman Bridgman (1823-99), American lawyer and reformer, was born in Hardwick, Vt. In 1883 he published a study of the *Civil Service in Great Britain*, and later became a member of the U. S. com-

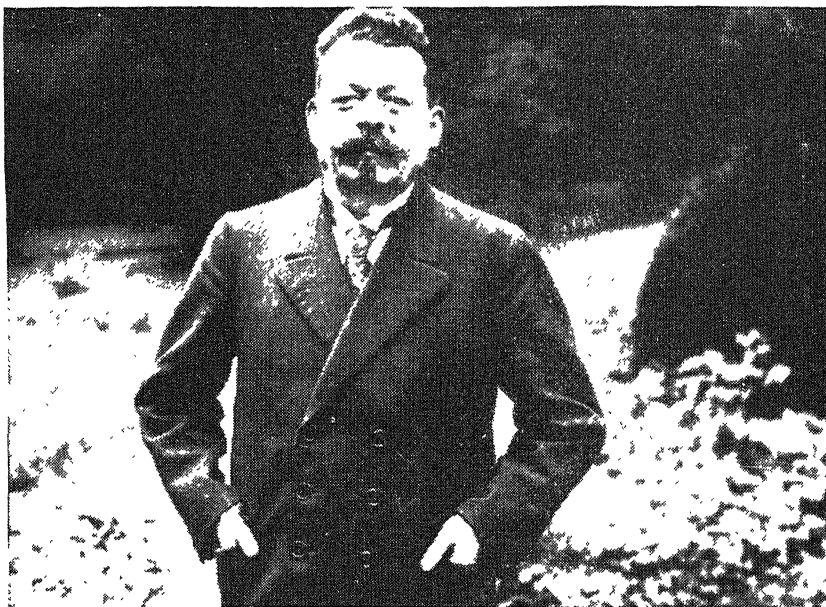
mission established by the Pendleton Civil Service Act, which he drafted, was the organizer of the National Civil Service Reform Association. By his will he left \$100,000 each to Columbia and Harvard Universities for the endowment of chairs in government.

Eaton, John (1829-1906), American educator, was born in Sutton, N. H.; was Commissioner of the U. S. Bureau of Education, 1870-86; president of Marietta College, 1886-91; president of Sheldon Jackson College, 1895-8; and Inspector of Education for Porto Rico, 1899.

Buren for the Democratic nomination in 1836, in preference to Vice-President Calhoun.

Eaton, Theophilus (c. 1591-1658), first governor of the colony of New Haven, was born in Stony Stratford, Buckinghamshire, England; assisted in compiling the so-called Connecticut Blue Laws, 1655. Consult S. E. Baldwin's *Life*.

Eaton, William (1764-1811), American soldier and adventurer, was born in Woodstock, Conn.; served in the Revolutionary army in 1780-3. In 1797 he was sent as U. S. diplomatic agent to Tunis, where he ended



Friedrich Ebert.

Eaton, John Henry (1790-1856), American public official, was born in Halifax, N. C.; served in the U. S. Senate, 1820-9; was Secretary of War in Jackson's Cabinet, 1829-31; Governor of the Territory of Florida, 1834-6; and U. S. Minister to Spain, 1836-40.

Eaton, Margaret (O'Neill) (c. 1796-1879), known as PEGGY O'NEILL, wife of John H. Eaton, noted for her wit and beauty. Her first husband, a purser in the navy, committed suicide, and she married Eaton, who shortly afterward, was appointed Secretary of War. The denial of her right to social recognition in Washington circles and President Jackson's espousal of her cause led eventually to a reorganization of the Cabinet, and resulted in Jackson supporting Martin Van

the piratical attacks on American shipping. With the aid of the American fleet he captured Derne, 1805, after a furious assault, in which he was wounded. On his return to the United States he settled in Massachusetts, where the legislature voted him 10,000 acres of land in recognition of his services. He was a witness against Aaron Burr at the latter's trial. Consult Felton's *Life of William Eaton*.

Eaton, Wyatt (1849-96), American painter, was born in Phillipsburg, Quebec; his principal achievement was a notable series of crayon character studies of American authors.

Eau Claire, city, Wisconsin, county seat of Eau Claire co., at the head of navigation on the Chippewa River; is an important manufacturing city, as well as a commercial cen-

ter, and a shipping point for lumber from the whole Chippewa district; p. 30,745.

Eau Créole, a French liqueur prepared in Martinique from pure rectified spirit and the flowers of the West Indian wild apricot or mammee apple.

Eau de Cologne, a perfume prepared from various alcoholic vegetable extracts, essential oils, and rectified spirit. It was probably invented by an Italian of the name of Farina, about the end of the 17th century, and was introduced into Cologne through Italian merchants.

Eau de Javelle, or **Javelle Water**, one of the first bleaching solutions obtained, was originally made at Javelle, west of Paris. It is prepared by passing chlorine gas through a cold dilute solution of a caustic alkali.

Ebel, Hermann (1820-75), German philologist, was born in Berlin. His chief work is his edition, 1871, of the *Grammatica Celtica* of Zeuss.

Ebenezer, a monument set up by Samuel between Mizpah and Shen in acknowledgment of Jehovah's aid in Israel's successful conflict with the Philistines. The name is also given to a place where the Israelites were defeated by the Philistines and the ark taken.

Eberhard I., im Bart (1445-96), first duke of Württemberg, was the second son of Louis I., count of Württemberg. He founded the University of Tübingen, 1477, brought about the treaty of Münsingen, 1482, which secured the integrity of Württemberg, and was instrumental in founding its constitution.

Eberhard, Christian August Gottlob (1769-1845), German poet, was born in Belzig, near Wittenberg; best known for his *Hannchen und die Küchlein* (1822; Eng. trans. 1854) and *Der erste Mensch und die Erde* (1828).

Ebers, Georg Moritz (1837-98), German Egyptologist and novelist, was born in Berlin. His most important discovery was the important *Papyrus Ebers*, published in 1875.

Eberswalde, town, Prussia, in Brandenburg; has iron and copper works, railway repair shops, sawmills, and brick works; p. 31,000.

Ebert, Friedrich (1871-1925), first president of the German Republic, born in Heidelberg. Served on the *Bremer Volkszeitung*, a Socialist paper. He assumed the leadership of the Social Democrats in 1913. Following the Revolution he was a member of the provisional government, and in 1919 was elected president of the new German republic.

Ebionites, a name first applied to Chris-

tians in general and later to heretical Jewish Christians.

Ebner-Eschenbach, Marie Baroness von, née Countess Dubsky (1830-1916), Austrian novelist, was born in Moravia; wrote *Erzählungen* (1875) and *Bozena* (1876).

Ebony, a hard wood obtained from certain trees belonging to the family *Ebenaceæ*. The ebony of commerce is chiefly obtained from the species of the genus *Diospyrus*. The best is yielded by the so-called ebony tree, *D. ebenus*, a native of the East Indies and Ceylon. The central or 'heart' wood of this species is black, and takes a beautiful polish. The American species, *D. virginiana*, known as the persimmon, furnishes a fairly good ebony. The so-called red ebony is brought chiefly from Madagascar, and the green ebony from Tobago and other West Indian islands.

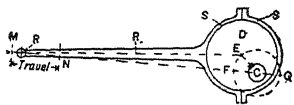
Eboracum. See **York**.

Ebro, river, Spain, rises in the mountains of Biscay, divides the Basque Provinces from Castile. On its banks are some of the finest vineyards in Spain.

Ecarté, a game of cards whose origin can be traced back to 1526, when it was termed *trionfi*.

Ecbatana, chief city of the ancient Median kingdom, lay at the foot of Mount Orontes, in the n. of Great Media.

Eccentric, in mechanical engineering a term used to denote a circular plate attached rigidly to a revolving shaft in such a way that the centers of the plate and shaft do not coincide. Eccentrics are used for giving a short-stroke motion to the valve and pump rods of steam-engines. They fulfill the same purpose as cranks, without weakening the shaft.



Eccentric: Elevation.

Eccles, town, England, in Lancashire, near the Barton locks of the Manchester Ship Canal; has manufactures of cotton thread, silk, fustian, and gingham; p. 45,750.

Ecclesfield, parish, England, in West Riding, Yorkshire. The church, the 'Minister of the Moors', is Perpendicular, with a fine oak screen, a reredos, and a monument to Sir Richard Scott; p. 23,400.

Ecclesia, the name given to the assembly of all the citizens at Athens in particular,

and also in other ancient Greek states. Four regular meetings were held in each prytany, or tenth part of a year, and extraordinary meetings might be called by the chief magistrates when occasion demanded. Citizens were liable to a fine for non-attendance, but from some time before 389 B.C. those who did attend received a fee of half a drachma for doing so, which was raised later on to a drachma and a half for ordinary, and a drachma for extraordinary meetings. The assembly directed the policy of Athens at every turn. It had also important judicial functions, but its resolutions, called 'psephisms', were not laws, nor did it undertake legislation.

Ecclesiastes, one of the Old Testament books, traditionally attributed to Solomon. It belongs to the Wisdom of Hohkmah literature of the Hebrews, and is a congeries of gnomic utterances about the vanity of human life, by no means disconnected, but not logically articulated or developed. Two main ideas recur again and again (1) that human life is resultless, and incapable of any worthy achievement, forming part of an unalterable system of things which God has decreed from the beginning; (2) that man can do no better than eat, drink, and enjoy good; since he cannot discover the secret of existence, and since death ends all, let him thankfully accept what God bestows.

Ecclesiastical Commissioners. The Ecclesiastical Commissioners for England were created by an Act of 1836. Their chief functions are the acceptance of grants of land and money for ecclesiastical purposes, the formation of new districts and parishes, the making of grants to meet benefactions offered in favor of benefices, and the fixing of fees.

Ecclesiastical Courts are tribunals having jurisdiction in matters of religion and church discipline. They originated with the early Christians, who tried to settle disputes among themselves without recourse to non-Christian judges. In England and elsewhere the ecclesiastical courts became a fruitful source of disputes between the crown and the see of Rome. After a long struggle the crown prevailed and clergymen were made subject to the law of the land and were prohibited from going beyond their jurisdiction; appeals to Rome were forbidden.

Modern legislation has greatly diminished the importance of church courts. They had till 1857 jurisdiction in testamentary and matrimonial causes. In the United States there are, of course, no ecclesiastical courts,

although the bodies of the various denominations which deal with matters of legislation and discipline are sometimes so-called.

Ecclesiastical Law may be defined as the rules and laws which relate to the ministrations and government, rights and obligations, of a church established in a state.

Ecclesiastical Year. See **Year**.

Ecclesiasticus, or **The Wisdom of Jesus, the Son of Sirach**, a book of the Apocrypha, belonging, like Ecclesiastes, to the Wisdom of Hohkmah literature of the Jews. It was in extensive use in the early church, and dates from c. 180 B.C. Like most of this class of Hebrew literature it consists of a series of gnomic sayings which, if not always religious in tone and sometimes even cynical and repellant, give a valuable picture of Jewish life at the time of its composition.

Ecclesiology comprises the history of the church as revealed in ecclesiastical architecture, church decoration, and archæology.

Eccremocarpus, a genus of sub tropical evergreen climbing plants, natives of Chile or Peru, belonging to the order Bignoniaceæ.

Echegaray, José (1832-1916), Spanish dramatist, mathematician and engineer, born in Madrid. Among his best plays are *La Esposa del Vengador* (1874); *En el Seno de la Muerte* (1880); *O Locura ó Santidad* and *El Gran Galeoto* (1881; Eng. trans. 1895). The Nobel prize was awarded to him in 1905.

Echidna, or **Spiny Ant-eater**, one of the two known types of monotremes or egg-laying mammals. Like its ally, the duckmole or ornithorhynchus, it is confined to the Australian region.

Echinocactus is a large genus of spiny, succulent plants belonging to the order Cactaceæ. They are more or less globular in form, and their flowers are usually borne on the top of the ribs. They are chiefly natives of Mexico and the neighboring countries. The species *E. Williamsii* is the source of the so-called 'mexcal buttons' used by the native Mexican Indians in their religious rites. These have the curious property of inducing, when eaten, an intoxication of color vision, the intellect remaining clear the while.

Echinococcus, the larva or bladder-worm stage of *Tænia echinococcus*, a tapeworm which infests the dog.

Echinodermata, a singularly compact division of invertebrates, for which no common name exists in English. All live in the sea, and the name refers to the spines which the skin usually bears, structures which are very conspicuous in the common sea-urchin. A

very striking peculiarity is the radiate or flower-like symmetry.

There are five living classes of echinoderms: (1) Echinoidea, or sea-urchins; (2) Asteroidea, or starfish; (3) Ophiuroidea, or brittle-stars; (4) Crinoidea, or sea-lilies; and (5) Holothuroidea, or sea-cucumbers. They are widely distributed, but are found most extensively in tropical waters. Their colors are often bright and the habits varied, though not a few inhabit muddy sand. Many echinoderms have a very extended vertical range, going down to the great depths, where most of the crinoids or sea-lilies now live.

Echinops, a genus of thistle-like composite flowering plants commonly known as globe-thistles. They are all hardy and vigorous herbaceous plants, easily grown in almost any situation.

Echinopsis, a genus of tropical cacti characterized by more or less spherical stems, prominent ribs, and long, tubular flowers.

Echinorhynchus, a genus of parasitic worms, usually included in the class Acanthocephala, which forms a division of the round worms or Nematelminthes. All the species are parasitic, as adults in vertebrates and as larvæ in invertebrates. They owe their name to their proboscis, which is armed with rings of hooks. The animals live attached by this proboscis to the alimentary canal of their host, which is usually in adult life a fish.

Echinus. See **Sea-Urchins**.

Echmiadzin, a monastery in Russian Armenia, 12 m. w. of Erivan, on the railway to Alexandropol. It is the seat of the Armenian primate. The monastery has some forty or fifty inmates. Attached to it are a printing establishment and a valuable library.

Echo, in Greek mythology a nymph who was punished by being deprived of her power of speech until she was first spoken to, when she was compelled to reply.

Echo, a sound reflected from walls, mountains, woods, clouds, or other obstacles. The sound thus appears to the listener to come from a direction which is not that of the original source. The sound waves are reflected according to the same laws as those that hold in light. See **SOUND**.

Echo Canon, a picturesque ravine in Summit County, Utah, about 20 m. n. e. of Salt Lake City. It is from 25 to 30 m. long and runs in a southeasterly direction to the Weber River. The steep, almost vertical walls of rock are a dull yellowish red and curiously shaped by erosion.

Echternach, town, Luxemburg, on the right bank of the Sure. The town is famous for its 'Dancing Procession,' performed every Whit-Tuesday in commemoration of a cure of cattle disease, probably cholera, by St. Willibrord. Boat building is a leading industry; p. 3,202.

Eck, Johann Maier von (1486-1543), German theologian. Eck was the leader of the opposition at the Leipzig disputation which lasted from June 27 to July 27, 1519, contending first against Karlstadt, whom he defeated, and less successfully against Luther. In 1520 he went to Rome to stir up Pope Leo x against Luther, and was appointed to carry into effect a sentence of excommunication against him. In the Conferences of Worms (1540) and Ratisbon (1541) he took part against Melancthon, Bucer, Calvin, and others.

Eckener, Dr. Hugo (1868-), airplane commander, was born in Flensburg, Germany. During the World War he trained air pilots. He commanded the Graf Zeppelin on her various flights.

Eckermann, Johann Peter (1792-1854), German author. In 1823 he became acquainted with Goethe, who shortly afterward made him his private secretary. He is chiefly remembered for his *Conversations with Goethe*.

Eckersberg, Christoffer Vilhelm (1783-1853), Danish realistic painter, was born in Varnaes, South Jutland, and studied under David in Paris. He executed seascapes, landscapes, historical and genre subjects, and portraits. A fine example of his precision and accuracy of detail is his portrait of Thorwaldsen. In 1818 he was appointed professor of the Copenhagen Academy and in 1827 director.

Eckford, Henry (1775-1832), American naval architect. During the War of 1812 he designed and constructed a fleet of United States war vessels on Lake Erie, and later he built the *Robert Fulton*, the vessel that accomplished the first real ocean voyage from New York to New Orleans and Havana by steam. Subsequently he built war vessels for the United States, European, and South American governments.

Eckhart, Meister (1260?-1327), German mystic, was born in Hochheim. He entered the Dominican order; was prior at Erfurt and provincial at Thuringia, became professor of philosophy in Paris (1300), and was later provincial of his order for Saxony. There are modern German translations of his works

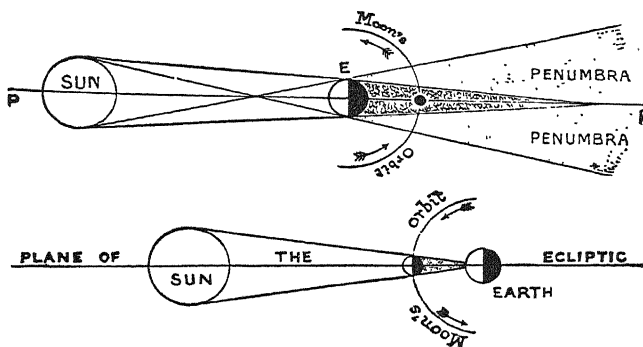
by Büttner and Landauer. Consult Martensen's *Meister Eckhart*

Eclampsia, a term which may denote any sudden attack of convulsions but which is used chiefly of such attacks occurring in relation to pregnancy.

Eclecticism, in philosophy, the attempt to reach a comprehensive and adequate system by selecting and combining the best features of previous systems.

Eclipse, an obscuration of one heavenly body by the intervention of another, either between it and the eye, or between it and the source of its illumination (see OCCULTATION). Solar eclipses are due to the passage of the moon in front of the sun. If the moon

diligently organized since 1842. Photography was first applied to the eclipsed sun in 1851, and by its means, on July 18, 1860, the solar status of prominences was definitively ascertained. Eight years later, during a great eclipse visible in India, their spectral character was determined. The green line of coronium was recognized by Young and Harkness, Aug. 7, 1869; and the eclipses of 1870 and 1896 were memorable, the one for Young's discernment of the prismatic flash of the reversing layer, the other for Shackleton's success in obtaining a snapshot impression of it. Scientific expeditions journey hundreds of m. for each eclipse, bringing back important data.



Eclipse of the Sun.

travelled in the plane of the ecliptic, they should occur each time that it was new; but since the lunar orbit is inclined to that plane at an angle of $5^{\circ} 8'$, they are possible only near the node. The solar ecliptic limits are $18^{\circ} 13'$ (major) and $15^{\circ} 21'$ (minor). An impressive preliminary to a total eclipse is the visible approach of the shadow, which appears like a dense storm-cloud rapidly advancing from the w. Then, three or four minutes before second contact, the rippling waves of semi-obscurity known as shadow-bands, caused, probably, by inequalities in aerial refraction, are seen to pursue each other across white surfaces, and vanish only with the last solar gleam. The darkness, even at totality, is by no means complete.

During the 19th century total eclipses of the sun were visible from some point in the United States seven times. The same number will hold in the 20th century. Besides those so widely observed in 1925 and 1932 there will be eclipses visible in 1945, 1954, 1970, and 1979. Eclipse expeditions have been

Lunar eclipses are caused by the moon passing through the shadow of the earth. The shadow of the earth extends at all times far beyond the moon's place. It forms a cone averaging 857,000 m. in length, but curtailed by 14,000 m. at perihelion, and elongated by an equal amount of aphelion. This is one of the several concurrent causes affecting the duration of lunar eclipses. Under favorable circumstances total immersion may last two hours, and the partial phases two hours more. The obscuring effect on the earth's penumbra is barely perceptible. The abnormal obscuration of Oct. 4, 1884, was attributed to atmospheric opacity produced by dust from Krakatoa.

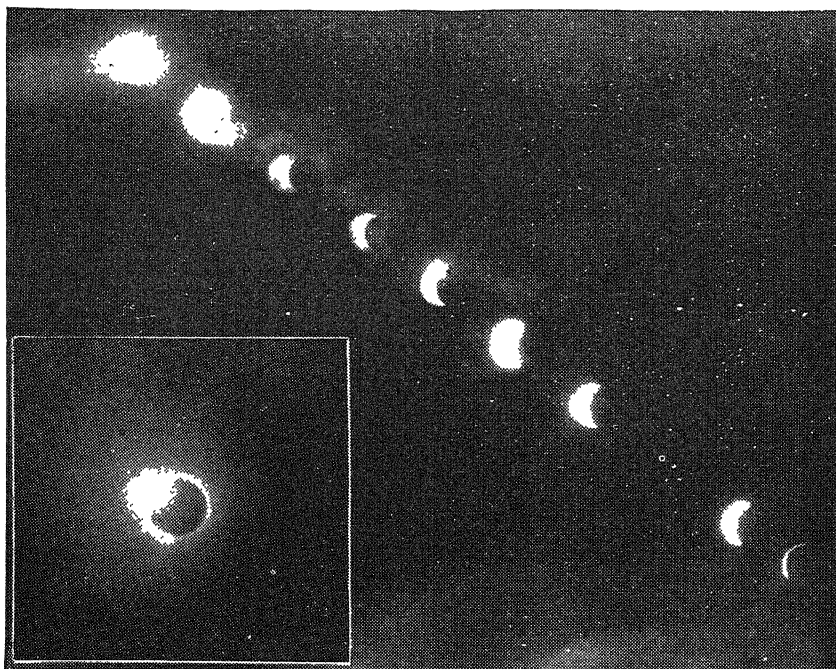
The systematic observation of star-occultations during eclipses dates from 1884. Their occurrence can be timed with particular accuracy at the dark limb of the moon; and their determination provides data of the highest value regarding the apparent dimensions, parallax, and orbital relations of our satellite.

Eclipse prediction was rendered possible to

ancient astronomers by their knowledge of the saros. A solar obscuration on May 28, 585 B.C., announced beforehand by Thales of Miletus, is the earliest historical instance of the kind. Babylonian records of eclipses

4 B.C., has availed to fix the beginning of the Christian era.

Eclipses, or occultations, of one star by another are incidental to the revolution of close binaries in planes passing approximately



Eclipse of Sun.

Photographic exposures on one plate show progress toward totality. First exposure, at top, taken about 45 minutes before totality, other exposures at 5 minute intervals, until only rim of Sun is visible.

date back to the 8th century B.C. Ancient eclipses are among the most useful and certain

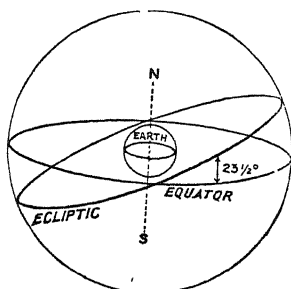


Diagram of the Ecliptic.

of chronological data. Thus, a lunar eclipse on the night of the death of Herod, March 13,

through the earth. The periods of eclipsing stars range from 9,900 days to four hours, and are subject to small though curious inequalities.

Ecliptic, the apparent path of the sun among the stars. It is a great circle of the sphere, inclined to the equinoctial at an angle of $23^{\circ} 27' 8''$, and cutting it in two opposite points named in 'equinoxes.' Its oscillations obey a complex law of periodicity. Celestial latitude and longitude are measured with reference to the ecliptic.

Eclogite, a rock which consists of pale-green angite, pale-green hornblende, pink garnet, with sometimes also quartz, feldspar, kyanite, bronzite, iron ores, and rutile. Such rocks occur in regions of crystalline schists, as the Alps, and are believed to be of intrusive origin in some cases.

Eclogue, a short pastoral poem probably originated by Theocritus. He and Virgil, who imitated him, produced many of these pastoral verses celebrating the loves and sorrows of the shepherds and their maidens. The 16th and early 17th centuries saw a revival of the eclogue, the most famous of the poets to use it being Spenser, with his *Shepherd's Calendar*. Other poets who have given us charming eclogues include Dante, Tasso, Ben Jonson, De La Vega, and Pope.

École des Beaux Arts, the French national school of fine arts, in Paris. It was founded at the time of the Revolution by the union of the academies of painting, sculpture, and architecture, to which was later added the school of engraving. Students of all nationalities attend the school and each year competitions are held for the Grand Prix de Rome. The number of students is about 2,000, the majority being French, but a large number of Americans are always in attendance.

Ecology, a branch of biology, especially of botany, dealing with mutual relations between organisms and their environment. Its study is closely bound up with that of plant physiology and morphology. See BOTANY; PLANTS; FLOWER; FRUIT; FUNGI.

Economic Planning. Since the beginning of the world's unprecedented economic difficulties, dating from the dislocations of the World War and culminating in the 1929 depression, the thoughts of business men and economists have turned toward the conception of a more highly organized society in which economic progress would be based on a greater degree of group planning. In President Roosevelt's 'New Deal' program (1933) America took a momentous step in this direction which, like the Russian planning experiment, was studied very carefully by the entire world. See U. S. HISTORY, NEW DEAL.

Economics. I. Definition—Economics has been defined briefly as the science which treats of the laws of the production, distribution and exchange of wealth. To this some have added a department of consumption, and others the principles of governmental control. II. DIVISIONS OF THE SUBJECT. 1. *The Production of Wealth*.—The agents of production are generally distinguished as three in number—(a) land, (b) labor, and (c) capital. The first is used comprehensively to denote the part played by nature in the production of wealth, whether her services be embodied, as in agriculture, in the original qualities of the soil, or take the form of the minerals contained beneath the surface, or consist of the situation of

the ground on which a house is built or a factory or shop erected, or be furnished in the shape of the forces of wind or water.

Labor represents the contribution made by man. The term is employed in the sense which embraces work with the brain as well as toil with the hands, and covers the direction and management of industrial enterprise no less than the execution of orders by laborers and artisans. Capital has been the occasion of some dispute. It has not always been regarded as distinct from labor. It has sometimes been treated as a derivative and secondary agent of production rather than as original and primary, and it is avowedly the outcome of past labor. For the sake of provisional illustration, capital may here be described as consisting partly of food, to support labor, and partly of materials and machinery, to aid labor, in the production of wealth. In the case of land, the most conspicuous of the general principles or laws which determine the quantity and regulate the quality of its contribution to wealth is known as the law of diminishing returns. It rests on the familiar experience that it is impossible to apply labor and capital to the cultivation of land without finding, sooner or later, that the produce yielded in return does not increase proportionally to the labor and capital applied.

This law is connected also with the general principles determining the increase of the second agent of production—labor; for the question of population hinges on its operation. The contrast between the apparent illimitable power of increase of the human species and the limitations, revealed by actual experience, in the productivity of the earth, led the economist Thomas Robert Malthus, 1766-1834, to propound the famous dictum that population, if unchecked, tended to increase faster than the means of subsistence. Recently economic opinion has favored more definitely the view which regards improvement as keeping ahead of population. For it is not merely the quantity but the quality or efficiency of labor which influences the amount and value of its contribution as an agent of production, and that efficiency depends to some extent on the numbers of the laborers. The physical strength, indeed, of the individual laborer, which is largely determined by the food he eats, the clothes he wears, and the dwelling in which he lives and works, is an important factor of efficiency. No less important are his mental aptitude and educational training. Nor are moral influences unimportant. Honesty in business relations has an economic bearing, as has also

a spirit of cheerfulness and hopefulness in work, as may be seen by comparing the costly unwillingness of the slave with the excessive toil of the peasant proprietor. In a modern community the efficiency of the individual laborer cannot be severed from the system under which his work is conducted. For the statement and illustration of the general principle most conspicuous here economic study is indebted to Adam Smith, 1723-90, whose *Wealth of Nations*, 1776, formed an epoch in the history of economics, not merely in consequence of his advocacy of free trade in opposition to the current creed of the mercantile system, but also because he separated more definitely than his predecessors had done the science of economics from the art of finance. Previously, economic writers had been mainly politicians, for they had been led to consider the causes of the wealth or poverty of nations by a desire to improve the finances of the sovereign. The general principle which Adam Smith expounded in connection with systems of work was the division of labor. The growth of divers occupations, the separation into various departments of a single industry, the appropriation of different districts to special trades, for which they possess natural or acquired advantages, are examples of the application of the principle. Division of labor is a necessary preliminary, as it is also a natural consequence, of exchanges in a market. Its chief advantages consisted, according to Adam Smith, in an increase of dexterity, a saving of time idly spent in passing from one occupation to another, and the more rapid discovery and adoption of improvements in the methods of work. Later inquiry has developed the treatment of these advantages, and added others, of which perhaps the most important is the more accurate adaptation of his work to the highest power of each worker. Extended beyond the boundaries of a particular country, the principle becomes one of the fundamental bases on which the argument for free trade was placed. It is undoubtedly specially characteristic of modern industry, and it is because that production on a large scale which is now the conspicuous feature of manufacturing enterprise affords opportunity for the more extended application of the principle that the law of increasing returns is a normal distinguishing sign, parting manufacturing from agricultural industry, where the division of labor is only possible in a much more limited degree. Production, however, on a large scale requires capital in more abundant measure. The increase of capital depends, on the one hand, on

the power to save what is possessed, and on the other, on the willingness evinced to incur the abstinence, or postponement of expenditure, involved. The force with which these motives operate is largely determined by the general security of society, by the confidence which those who can save can feel that they will not be robbed of their savings through the impotence of the government to protect from violence or fraud, or its own desire to appropriate their wealth by forcible extortion or excessive or irregular taxation.

2. *The Distribution of Wealth.*—J. S. Mill drew a distinction between the laws of production and the laws of distribution. He declared that the former were dependent on external physical conditions, allowing of little alteration by man; while the distribution of wealth was largely a matter of human arrangement. Professor Nicholson has argued that Mill laid at least excessive stress on this distinction, and that the moral drawn by socialists was misleading, if it was not untrue. Yet the laws of distribution, as given in an economic text-book, rest apparently on the assumption of the presence and influence of such competition as can be fully evident only in a modern business community, and it is at any rate conceivable that in a society organized on a socialistic basis they would be stated differently. At any rate, the general principles of distribution now take competition as the normal rule, and regard interference with its action not as practically impossible or ethically wrong, but as exceptional. Competition, therefore, being assumed, the general principle determining the distribution of wealth may be stated thus: The share which is likely to be obtained by any agent will depend, firstly, on the total amount of wealth produced; and secondly, on the urgency with which its contribution is required by the other agents. The total amount of wealth produced will depend on the efficiency of the different agents and their cooperation. The urgency with which the services of any one are demanded by the others will depend also on their respective efficiency, but will be influenced, in addition, by their relative scarcity or abundance. It is the interest of all that all should be efficient. It is the interest of each that it should be relatively scarce and the others comparatively abundant. Such a general principle as this is seen determining the sale and purchase of commodities exchanged for one another in markets, and hence a tendency has grown more evident to regard distribution as one department of exchange. Present economists, recognizing fully

that human agents of production may be influenced by feelings other than those affected by competition are nevertheless disposed to treat the laws governing the exchange of commodities as capable of being extended generally to the factors of production. The older economists gave the names of rent, profits, and wages to their respective shares or rewards. Later economists, anxious to emphasize the part now played by the employer in the conduct of business, with its elaborate organization, have separated in analysis the functions and reward of the employer from those of the capitalist. J. S. Mill distinguished three component elements in profits, which he regarded as the share of the capitalist. These elements were interest, insurance, and wages of superintendence. Adam Smith, writing at a time when the organization of industry was simple, declared that it was wrong to regard profits as the wages of a particular sort of labor and maintained that they were regulated by different principles, varying according to the amount of stock or capital employed. Common usage still continues to regard profits as comprising an ingredient of interest as well as forming a reward for managing capacity.

Francis A. Walker held that the share of the employer was determined not by the general principles applicable to interest and wages, but by the special law regulating rent. For the explicit statement of that law economic science was indebted to David Ricardo, 1772-1823. It may be given briefly in these terms: Rent is a payment for the use of land measured by the advantages attaching to its occupation, compared with that of land which is only just worth cultivating, and yields no more by the sale of its produce than the bare cost of cultivation. Rent, in fact, is a surplus, issuing from a differential advantage. That advantage may arise in consequence of the superior fertility of some land to other land, or from its more favored situation with reference to the market where the produce is conveyed for sale. Walker argued that in the case of profits similar differential advantages arose, due to greater aptitude for business or more favorable opportunity. Land is an example par excellence of the source of such differential advantage, for there it is more permanent in character; but a similar temporary advantage is seen in the case of capital invested in the improvement of the soil, or in machinery, or education, and the owners of capital or the possessors of education enjoy a surplus of the nature of rent in the interval before their advantage is taken from them by the advance of knowl-

edge or the extension of improvement. As the differential advantage which thus belongs to them is temporary in nature the title of quasi-rent has been introduced as appropriate.

3. *The Exchange of Wealth.*—A third section of the science of wealth is devoted to the treatment of exchange. Some important developments of thought favor the conception of economics as the science of measurable motives. The use of money is not necessary to this measurement, but it certainly makes it more easy and complete; money increases the range and improves the mode of exchange. But perhaps it is not the most important. That is devoted to the theory of value. The contribution made by Adam Smith to the formation of that theory, showing how value measured human motives, gave him, in the opinion of some, the first place in an order of development. More recent economists, such as Henry Sidgwick and Professor Marshall, have argued that the main principles of the ruling theory of exchange may be applied to the exchange of the services of the agents or factors of production, as well as the exchange of the commodities which they have assisted or cooperated to produce. The theory of value, according to this comprehensive conception, offers in the first place a rational explanation of the forces affecting the exchange of commodities in markets lying within the boundary of a single country. The same fundamental ideas applied here, allowing for difference due to a greater cost of carriage, and a comparative immobility of capital, and in a higher degree of labor, may be used to interpret exchanges between different countries, or what is called international value. The theory of value, lastly, is applied to services as well as to commodities. It becomes thus the central theory of economics. It sets itself to ascertain and to measure the forces which influence sellers and buyers respectively. Such forces may direct their immediate action at the passing moment, or determine their average conduct when sufficient time has been given for more permanent, deeply-seated causes to assert themselves. In the first of these cases the market value, in the second the normal or natural value, is considered. In the first the competition of dealer with dealer, is supposed to operate to prevent one dealer from buying or selling the same quantity of a commodity of the same quality on different terms from his competitor. In the second case industrial competition enjoys the opportunity of a period sufficiently long to allow its influence on the agents or factors of production to become manifest, increasing the

supply of the commodity if the price has risen, and diminishing it if the price has fallen, by effecting their entrance into or exit from the industry in question under the inducement of augmented or curtailed reward. The market influences are transitory, and may be settled or altered by sudden speculation or temporary combination. The normal influences are, by comparison, permanent; for they alter but slowly, and exert a controlling power on the market fluctuations. The supply of a commodity depends on the action of the sellers, and the demand on that of the buyers. Although the buyer, offering money, is also in essence a seller of the money which he offers, and the seller, disposing of commodities, is similarly a buyer of the money which he receives, yet, for convenience, it is at once easier and more effective to regard one side of the dual transaction at a time. The older economists laid the stress of their emphasis on the side of the sellers. They argued that the chief motive influencing their action was the cost of production. The cost of production meant the effort of labor undergone, and the abstinence or postponement of expenditure involved in accumulating the capital required for the production of the commodity in question. Unless labor and capital, taking into account total advantages and disadvantages, whether in the form of monetary reward or of social standing or surrounding circumstances, met with a remuneration equivalent to what they could gain in other occupations, they would gradually be withdrawn from the industry in question, and the supply would diminish until sufficient temptation were offered in an increase of price. Similar competitive forces, encouraging the influx of labor and capital into the particular industry from other occupations, where their reward became less in comparison, would operate to prevent the price from rising above the cost of production. And thus from the point of view of the sellers—or supply—the price in the long run tended to correspond with the cost of production. These expenses themselves varied with the scale of production. Where the commodities obeyed that law of diminishing returns which was generally prevalent in agriculture, the expenses tended to increase, as the scale was greater; and the position of the sellers whose expenses of production were the largest, whose condition with regard to fertility of land or its distance from the market was least advantageous, governed the price of agricultural produce. In the case of manufactured articles, on the other hand, a law of increasing returns was a normal char-

acteristic, and here, with an enlargement of the scale of production, the expenses would tend to diminish.

It is impossible, therefore, to construct a complete theory of value, from the side of the sellers, without recognizing that the forces determining supply are affected by the extent and intensity of demand influencing the scale of production. But in its turn the law of demand is not independent of the forces affecting supply, at any rate in a great number of cases. The conception, which has been rendered more emphatic and explicit by later economists, is that of final or marginal utility. The older writers acknowledged that the utility or desirability of a commodity was the chief factor determining the extent and intensity of demand. They perhaps discerned dimly that the larger the quantity men already possessed of some one commodity the less likely they were to desire an additional quantity; but they failed to give formal, exact expression to this truth. They did not see or show that, just as farmers of land on the margin of cultivation determined the price of agricultural produce, so buyers, who were hesitating whether they should buy or not—who were on the margin, so to say, of purchase or consumption—determined the price of the articles they were just tempted to buy. The price represented and measured accordingly the final or marginal utility of the commodity in question, and from the point of view of the buyers—or demand—this final utility was the important factor. But it varied with the extent of the supply, and thus the forces affecting demand and supply became interdependent.

4. *The Consumption of Wealth.*—A further significant consequence of the later developments in the theory of value, and the increased prominence given to demand, has been the claim advanced for a separate section on the consumption of wealth. That would be concerned in the main with topics connected with the conditions and circumstances of demand. Professor Simon N. Patten, of the University of Pennsylvania, has contended that the laws governing the development of wants are the fundamental forces making for change in economic life. While this view is generally regarded as extreme, no instructed economist would deny that the consumption of wealth may properly be regarded as the goal of economic action, and that influences affecting consumption are of primary significance for the economic theorist.

5. *The Principles of Governmental Control.*

—There can be no question that, historically

viewed, the study of economics itself started with the discussion of the best mode of increasing the revenues of the sovereign, that Adam Smith devoted no unimportant portion of his *Wealth of Nations* to matters of taxation, that Ricardo's chief treatise was entitled the *Principles of Political Economy and Taxation* (1817), and that the tradition thus firmly established was maintained by later writers. The science of economics has gradually thrust to the background that art of finance from which it originated, and the scientific interest of taxation itself may be said to lie mainly in the consideration of its incidence. But economists have not limited their inquiries to the theory of incidence; they have also considered the rules or maxims of taxation in practice. That the limits of governmental interference should receive large consideration in a section of an economic treatise is similarly a natural consequence of the history of the study. Natural liberty, to employ the phrase on which Adam Smith laid especial stress, superseded governmental interference, and then, and then only, was a science of economics, concerned with the relations of cause and effect, slowly but definitely substituted for the art of administration, and especially of finance. For similar reasons it was to be expected that earlier economists, in the first full enjoyment of emancipation from old, and, as they thought, obsolete restraint, should wish to curtail rather than extend governmental activity. In England such an attitude was confirmed by the great practical success achieved in actual politics in the middle of the 19th century by the introduction of free trade. It has never enjoyed undisputed sway in America or on the Continent of Europe, although everywhere economists have been influenced by it. Consult: Adam Smith's *An Inquiry into the Nature and the Causes of the Wealth of Nations* (1776); David Ricardo's *Principles of Political Economy and Taxation* (1817); Stuart Mills' *Principles of Political Economy* (1848); J. N. Keynes's *Scope and Method of Political Economy* (1897); A. E. Monroe's *Early Economic Thought* (1924); L. H. Haney's *History of Economic Thought* (1911). The principal American periodicals publishing scientific articles on economics are the *Quarterly Journal of Economics* (Harvard), the *Political Science Quarterly* (Columbia University), *Journal of Political Economy* (Chicago University), the *Yale Review*, the annals of the American Academy (University of Pennsylvania), and the American *Economic Association Publications*.

Economic World Conference, 1933.

On May 3, 1933, the League of Nations sent invitations to 66 nations to attend the World Monetary and Economic Conference to be held in London on June 12, 1933. Optimists hoped that since economic nationalism had not yet proved able to ameliorate conditions, economic internationalism might be given an opportunity. There were several major obstacles to the recovery of economic health by the individual countries which were, presumably, amenable to treatment by international agreement. One was the problem of the unpaid war debts to the United States. Another major obstacle was the obstruction to trade offered by prohibitive tariffs and super-tariff import and export restrictions, quotas, export bounties and the like. Of equal importance with the necessity for tariff reduction was the demand for currency stabilization. A fourth obstacle to world economic recovery was the low level of wholesale commodity prices, which had fallen about one-third in the previous three years. While most nations approved the raising of world prices the manner in which this was to be effected was a moot question. The American delegation to the conference was composed of: Secretary of State Hull, chairman; James M. Cox of Ohio, vice-chairman; Senator Key Pittman of Nevada, Senator James Couzens of Michigan, Representative Samuel D. McReynolds of Tennessee, Ralph W. Morrison of Texas; and a staff of expert advisers. The conference opened on June 12, with Prime Minister MacDonald as chairman. In his opening speech the British Premier urged the immediate solution of the war debts problem by the nations concerned, while admitting that it lay outside the province of the conference itself. On the following day the British Government announced a payment of \$10,000,000 'as an acknowledgment of the debt, pending a final settlement.' Although \$75,950,000 was due, President Roosevelt did not term the British action a default and asked for the postponement of formal requests for reduction of the debt so that the work of the conference might not be hampered.

The conference agenda was in six main divisions: (1) Monetary and credit policy; (2) prices; (3) resumption of the movement of capital; (4) restrictions on international trade; (5) tariff and treaty policy; (6) organization of production and trade. For some weeks the conference staggered along in anticlimactic fashion but it was apparent that the United States was going to persevere in its domestic policy of price-raising, public works,

and inflation and that the gold standard countries were going to stick to gold; Great Britain, after some tentative moves in favor of the United States' policy, continued to steer a middle course and to peg the pound to the franc. Nothing was effected with regard to tariffs or any other major problem. The one achievement, however, was an agreement brought about by Senator Pittman, on the part of silver producing and silver-using nations not to dump the metal on the world market. The plan, signed July 20, provided that for the next four years India, China, and Spain would not export on an average more than 40,000,000 fine ounces of silver a year. The conference adjourned 'temporarily' on July 27, its existence sustained by a continuing committee which was to prepare for a possible reconvention. The total cost of the conference was estimated at \$5,000,000.

Economist, The, a London journal founded in 1843, to discuss financial questions in the wider social and economic aspect.

Economizer. The fuel economizer, as used at large power-supply stations, is an apparatus for heating the feed water for boilers by means of the waste heat that would otherwise pass up the chimney and be lost. It consists of groups of vertical cast-iron tubes placed in the main flue between the boilers and the chimney. These are coupled by branch pipes at top and bottom, and so arranged that the cold feed water enters the pipes at the chimney end and is delivered from the other end hot to the boilers. Each tube is surrounded by a set of scrapers, driven off shafting or by a special motor, which move slowly up and down to keep the external surface free from soot, which is a non-conductor of heat.

Economus, cape on s. coast of Sicily, between Agrigentum and Camarina, off which Marcus Atilius Regulus decisively defeated the Carthaginian fleet in 256 B.C., during the first Punic War.

Ecorché, a term employed in artistic study to denote the frame of man or animal stripped of skin so as to display the muscular system.

Ecorceurs, a name applied to certain lawless bands of soldiers that infested France and Belgium during the Hundred Years' War.

Ecraseur, a surgical instrument invented by the French surgeon Chassaignac for the removal of certain morbid growths. In operating with an *écraseur*, a thin chain or wire loop is passed round the base of the tumor and gradually tightened by a toothed wheel. By its action the tissues are torn across, its advantage over a knife depending on the fact

that clotting occurs more readily at the end of an artery or vein which has ragged edges than it does in vessels severed by a clean cut.

Ecstasy, a state of mental exaltation, characterized on the physical side by lowered or extinguished sensibility to external stimuli, and on the mental side by concentration on one or a few ideas, a sense of increased well-being, free flow of images (hallucination), a conviction of their objective truth as 'revelations,' and temporary suspension of the will. In pathology the term *ecstasy* denotes a morbid condition allied to catalepsy, but differing from it in that it is characterized by absorption in a single idea rather than by complete unconsciousness and in that the patient later retains memories of the ecstatic state.

Ecthyma, a pustular disease of the skin, in which the pustules often reach the size of a pea, and have a red, slightly elevated, hardish base.

Ectoderm, or **Epiblast**, the external germinal layer of the embryo, giving rise especially to the outer skin, nervous system, and the essential parts of the sense organs in the adult. See EMBRYOLOGY.

Ectropion, a pathological condition of the eyelid in which the lid is everted and the conjunctiva or mucous membrane on the inside of the lid is exposed. It may be the result of swelling of the conjunctiva, or of cicatricial contraction of the skin, drawing the eyelid down.

Ecuador, republic of South America, so named because it is traversed by the equator, extends along the Pacific coast, being inserted like a wedge between Colombia on the n. and Peru on the s. Ecuador is divided by the Andes into three zones—the coastal strip, the Andean region, and the plains of the Amazon tributaries. The principal coast streams are the Guayas River and the Rio Esmeraldas. East of the Andes are the Nepo with its affluents and other streams of the Amazon system. Although Ecuador lies in the equatorial belt, its climate is diversified because of the varied character of the country. The temperature is generally higher on the coast, while on flanks of the Andes and in the inter-Andean hollows it is much lower. In all parts of the country there is one dry and one wet season. Along the northern littoral the humidity is greater and the rainfall more copious, owing to the higher temperature of the sea. The flora and fauna are as varied as the climate. The Peruvian balsam, vanilla plant, caucho or rubber tree, cacao tree, and valuable cabinet woods are found extensively in the forests. On

the tropical seashore, mangroves grow in profusion. Several species of cactus and lichens abound on the dry pampas, while palms are found in the wet regions. Thick grasses are a feature of the landscape in Western Ecuador. The fauna is rich: the mammalia include the jaguar, puma, ounce, ocelot, deer, tapir, peccary, capybara, and several species of monkeys and bats; fish abound, both in the rivers and along the coast; and among reptilia are the boa constrictor, turtles, and alligators, which swarm in the streams, especially on the Pacific side. Birds and insects occur in vast variety.

Agriculture is by far the most important occupation. Cocoa furnishes about 30 per cent. of the value of all exports. Rubber grows wild in abundance but, as a commercial product, fails to compete with Oriental plantation rubber. Coffee is the second ranking crop. Mangrove bark, kapok, sugar, potatoes, bananas, alligator pears, oranges and pineapples can be grown for export. Corn, alfalfa, wheat and barley grow well at higher levels where stock-raising and dairying promise to increase. Butter and hides are exported. The rich mineral resources are little developed. Panama hats are made for export. Other manufactures are sugar, flour, chocolate, textiles and brewery products. Ecuador had 702 m. of railroads in 1940, all under government control. There is mail and passenger air service to South American ports. Steamship lines connect with Pacific coast ports and with Europe, while river steamers furnish communication to the principal agricultural districts. No exact census had ever been taken as late as 1932, when the population was estimated at 2,500,000 made up as follows: Indians (38 per cent.); mixed races (41); whites (10); Negroes (5); others (5); lowland Indians (1). Primary education is free and obligatory. Higher education is furnished in secondary schools and teachers colleges and in commercial and technical schools. There is a law college at Loja, and there are universities at Quito, Guayaquil and Cuenca. The government is in the hands of a president, elected by direct popular vote; a minister of the interior; a cabinet of six ministers; and a congress, and a chamber of deputies. Governors administer the provinces. Adults of either sex who can read and write may vote. The ancient kingdom of Quito, constituting the present country of Ecuador, was early inhabited by tribes from Central America. Spain conquered the country about 1534 and the former Quito became a part of the viceroyalty of Peru. In 1820 it won its freedom from Spain and in 1822 was incorporated

with Colombia. It was formed into a separate republic in 1830. In 1916 the Colombian boundary was fixed. A new constitution was promulgated in 1929. Ecuador has a model child labor law and an eight-hour labor law. The boundary dispute with Peru was settled by compromise Jan. 29, 1942. Jan. 28, 1942 Ecuador severed diplomatic relations with the Axis powers. Consult U. S. Department of Commerce *Trade Information Bulletin No. 773* (1931); Great Britain Department of Overseas Trade *Annual Report on Economic Conditions in Ecuador*.

Ecumenical, or **Œcumenical**, a word derived from the Greek, signifying 'general,' 'universal'; specifically, 'belonging to the Church universal.' The ecumenical symbols are the three great creeds—the Apostles', the Nicene, and the Athanasian. See **COUNCILS**.
E. C. W., Emergency Conservation Work. A U. S. New Deal agency.

Eczema, an inflammatory skin disease, characterized by a sense of itching or burning, which may amount to pain, and by exudation and infiltration of the inflamed skin.

Edam, town, province North Holland, Netherlands, near the w. shore of the Zuider Zee. It carries on an extensive trade in cheese; p. 7,960.

Edda ('great-grandmother'). The Norse term Edda has been applied to two collections of old Norse or Icelandic literature, known respectively as the *Edda Snorri Sturlusonar*, otherwise the 'Younger' Edda, and the *Edda Sæmundar*, or the 'Elder' Edda. The Younger Edda, that of Snorri Sturluson, 1179-1241, chief justice of Iceland, was discovered by Arngrim Jonsson in 1628, and consists of three parts: (1) *Gylfaginning*, mythological stories told by Odin to Gylfi, a Swedish king, forming the chief source of our knowledge of the Scandinavian theogony; (2) *Skáldskaparmál*, or the Art of Poetry; and (3) *Háttatal*, a system of prosody. The Elder Edda, a series of lays in alliterative verse, was discovered in 1643 by Brynjulf Sveinsson, an Icelandic bishop. The poems belonging to the Elder Edda are 33 in number, with prose passages interpolated here and there by the collector. They are on subjects partly of Scandinavian mythology, partly of heroic and legendary history. The Eddas were influenced, as in the case of *Beowulf*, by Christian ideas, and affected by beliefs prevalent in Britain, and carried to Iceland by way of the islands of Scotland. An English translation was made by Cottle in 1797, but the best version is by Thorpe, published in 1866.

Eddington, Sir Arthur Stanley (1882-1944), British astronomer. He was assistant at the Royal observatory, Greenwich, 1906-13; professor of astronomy, Cambridge University, 1913; director of the Cambridge observatory, 1914.—He was knighted in 1930. His published works include *Report on the Relativity Theory of Gravitation* (1918); *The Mathematical Theory of Relativity* (1923); *Stars and Atoms* (1927).

Eddoes. See **Cocco**.

Eddy, Clarence (1851-1937), American organist and composer, born Greenfield, Mass., was organist of the First Congregational, 1874-6, and First Presbyterian, 1879-96, Churches, Chicago, and general director of the Hershey School of Musical Art, 1875-1908. He gave recitals in the principal cities of America and Europe and was officially identified with many expositions. At the Panama-Pacific exposition, held at San Francisco (1915), he gave forty recitals. He was especially noted for his extensive repertory. He was author of *The Church and Concert Organist* (3 vols., 1882); *The Organ in the Church* (1887).

Eddy, Henry Turner (1844-1921), Am. scientist, was born in Stoughton, Mass. He was graduated from Yale University and the Sheffield Scientific School, and studied in Berlin and Paris. He was adjunct professor of mathematics at Princeton (1873-4); professor of mathematics, astronomy and civil engineering (1874-90), and acting president (1890) of the University of Cincinnati. He was president of Rose Polytechnic Institute, 1891-4; head professor of mathematics and mechanics in the College of Engineering, 1907-12, and dean of the Graduate School, 1906-12, of the University of Minnesota. His published works include: *Researches in Graphical Statics* (1878); *Thermodynamics* (1879); *Concrete Steel Construction* (1914).

Eddy, Mary Baker (1821-1910), the founder of Christian Science, was born at Bow, near Concord, N. H. Before discovering Christian Science she was known as a speaker on temperance. Mrs. Eddy dated her discovery from 1866, at Lynn, Mass., when she recovered by divine aid from a serious injury. The distinctive features of her teaching were its absolute distinction between spiritual being and material belief, and its emphasis upon healing which follows this distinction. She issued her principal work, the Christian Science textbook, in 1875. As revised occasionally until 1906 and entitled *Science and Health with*

Key to the Scriptures, this book is the authoritative and standard statement of Christian Science. Until her death, Mrs. Eddy was pastor emeritus of the church. As the leader of the Christian Science movement, she instituted all its pioneer undertakings and suggested or approved all its rules and regulations as contained in the Manual of the church at the present time. At her death, in 1910, she left her estate of some \$2,000,000 to The Christian Science Board of Directors, the governing Board of The Mother Church, for the purpose of promoting and extending the religion of Christian Science. See **CHRISTIAN SCIENCE. Bibliography.** Consult Lyman P. Powell, *Mary Baker Eddy: A Life Size Portrait*; and *Life of Mary Baker Eddy* by Sibyl Wilbur.

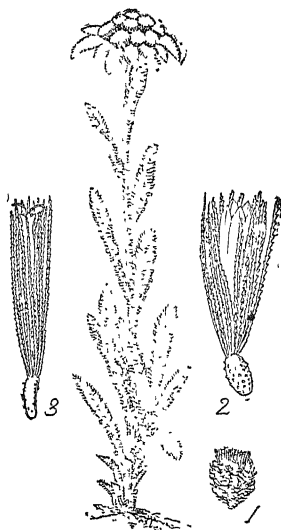
Eddy, Nelson, singer, born in Providence, R. I. June 29, 1901, of American parents. He was reporter for Philadelphia newspapers from 1916 to 1920, was advertising writer for Philadelphia agencies from 1920 to 1925. Became an opera and radio singer in 1923. Had been a pupil of Vilonat in New York, Paris and Dresden, later under the guidance of Dr. Lippe of Philadelphia, an advocate of the Vilonat method. He entered motion pictures in 1935. Has appeared with the Philadelphia Civic and Grand Opera, the Los Angeles Opera Company and with choral organizations. He made his debut in professional grand opera in 1924 as Tonio in *Pagliacci* with the Philadelphia Civic Opera Company.

Eddy, William Abner (1850-1909), American scientist, was born in New York. He was the first to take the temperature at various heights in mid-air by means of thermometers attached to kites, 1891, and to take photographs by similar means, 1895. He later experimented with atmospheric electricity by means of wires upheld by kites.

Eddystone Lighthouse, situated in the English Channel, about 9 miles from the coast of Cornwall, and 14 miles s.w. of Plymouth breakwater. The first lighthouse, which was constructed of wood on a stone base, was completed in 1700, and swept away by a storm three years later. The second, which was also of wood, with a stone base, was erected in 1706-9, and was burned down in 1755. The third built, 1757-9, of elaborately bonded stone, endured for over a hundred years, being at length dismantled and replaced by the fourth Eddystone lighthouse, completed in 1882 by Sir James N. Douglass. It is of circular section, widening in diameter toward the

bottom, and resting on a cylindrical base 23 ft. high and 44 ft. in diameter. The lamp, which has a range of $17\frac{1}{2}$ m., gives a double flash at intervals of half a minute.

Edelweiss (*Leontopodium alpinum*), a beautiful little hardy plant belonging to the Compositæ, found growing in damp places at considerable altitudes throughout the Alps. It is also cultivated in rock gardens.



Edelweiss.

1, Flower head; 2, floret, outer;
3, floret, disc.

Eden (Hebrew 'delight'), the region in which, according to the Biblical narrative, the Garden of Paradise, the first home of man, was situated. Josephus and his followers locate it between the Ganges and the Nile; others in Southern Babylonia; still others in Armenia, near the source of the Tigris and Euphrates.

Eden, Anthony, 1897- , Eng. soldier and diplomat. Ed. at Eton and Christ Church, Oxford; capt. of the King's Royal Rifle Corps in the World War. Since 1923 he has been a M.P. He was Under Secy. of State for House Affairs 1924-25, Parliamentary Private Secy. to Secy. of State for Foreign Affairs 1926-30, Lord Privy Seal 1934, Minister for League of Nations Affairs 1935. He was appointed Secy. of State for Foreign Affairs Dec. 1935, succeeding Sir Samuel Hoare, and has been prominent in internatl. affairs at home and abroad. Differing with Prime Minister Chamberlain on foreign policies, Mr. Eden re-

signed from the Cabinet, Feb. 1938; became Foreign Minister, 1940, and Leader of the House of Commons Nov. 22, 1942. He participated in the World War II conferences, and with the advent of the Labor Government in 1945 left the Cabinet.

Eden, Sir Robert (1741-84), American colonial governor, born in Durham, England; became proprietary gov. of Md. in 1768.

Eden, William. See **Auckland**.

Eden Hall, the ancient seat of the Musgraves in Cumberland, England. Here is still preserved the famous 'Luck of Eden Hall,' an old painted glass goblet said to have been snatched from the fairies, on the safety of which the welfare of the house is reputed to depend.

Edentata, or **Bruta**, a primitive order of mammals established and named by Cuvier. The typical edentata are the Sloths, Ant-Eaters, and Armadillas, found in South America; but it is customary to include in the order the Pangolins, or Scaly Ant-Eaters, of India and Africa, and the Cape Ant-Eaters or Aardvarks of Africa, forms whose relations are uncertain. The Edentata are characterized either by entire absence of teeth, or by the absence of teeth from the front of the mouth.

Edenton, town in northeastern North Carolina, county seat of Chowan county. A United States fish hatchery is located here; p. 3,563.

Edeson, Robert (1868-1931), American actor, was born in New Orleans, La., made his first stage appearance at the Park Theatre, New York City, in *Fascination*, 1887. He was leading man with Maude Adams in *The Little Minister* (1897-8) and in *The Climbers* (1901), and starred in *Soldiers of Fortune* (1902-04), *Ransom's Folly*, *Strongheart* (1905-6), *Where the Trail Divides* (1910), *The Arab* (1911), and *Fine Feathers* (1913-14). From 1914 he devoted most of his time to playing leading parts in motion pictures, and was especially popular in the talking moving pictures.

Edessa, ancient city in northwestern Mesopotamia. The city is regarded by Arabic tradition as the home of Abraham. From 137 B.C. to 216 A.D. it was the capital of the independent kingdom of Osroene. It came into the hands of the Romans in 217, of the Persians in 609, and of the Mohammedans in 641. In 1097 it was captured by the Crusaders under Godfrey of Bouillon, but was retaken by the Mohammedans in 1144. After a period during which it was successively under the control of Egypt, Byzantium, the Mongols, Turkomans,

and Persians, it finally passed to the Turks in 1637. Christianity was established in Edessa at an early date, and it was there that the alleged correspondence between King Abgar and Christ was discovered by Eusebius.

Edfu, town, Upper Egypt, on the River Nile. Here are the remains of the *Temple of Horus*, considered the most perfect example of an ancient Egyptian temple in existence. It was begun in 237 B.C. by Ptolemy III, on the site of an earlier sanctuary; his successor, Philopator, completed the masonry in 212 B.C.; and later monarchs added the great vestibule, colonnaded court, girdle wall, pylon, and reliefs and inscriptions. Edfu is the ancient *Apollinopolis Magna* and the Coptic *Atbo*. The present inhabitants are Copts and Arabs, who produce cotton and pottery; p. 20,000.

Edgar, or **Eadgar** (944-975), king of the English. Elected king by the northern insurgents against his brother Eadwig, 957, on the latter's death he became king of the West Saxons also, 959. He brought about many monastic reforms.

Edgar Atheling (c. 1050 c. 1120), although the nearest heir to the throne, submitted to William; joined in two unsuccessful attempts to overthrow William, and later took refuge with Malcolm Canmore of Scotland, to whom he gave in marriage his sister Margaret. In 1097 with the aid of William he set his nephew Edgar on the Scottish throne and later became a crusader, but returned to England and died in obscurity.

Edge, Walter Evans (1874-), American public official, was born in Philadelphia. He first worked as an apprentice on the *Atlantic Review*, Atlantic City; later became proprietor of newspapers in Atlantic City and was identified with several banking interests; member of the New Jersey Assembly, 1910; of the Senate, 1911-16; governor of New Jersey, 1917-20; U. S. Senator, 1919-29; U. S. ambassador to France, 1929-33; governor of New Jersey, 1944-.

Edgehill, a ridge on the border of Warwick and Oxford shires, England. A tower, erected in 1760, marks the scene of the first great battle, Oct. 23, 1642, of the English Civil War.

Edgeworth, Henry Essex (1745-1807), Irish priest; became confessor to the Princess Elizabeth, and in 1793 to her brother, Louis XVI, just sentenced to death, whom he bravely attended to the scaffold. He reached England safely, 1796, and later became chaplain to Louis XVIII at Mittau.

Edgeworth, Maria (1767-1849), Irish

novelist, was born in Black Bourton, Oxfordshire, and was educated in Derby and London. Her first published work, a plea for female education, appeared in 1795, under the title *Letters to Literary Ladies*. *The Parent's Assistant*, children's stories, followed in 1796, and *Practical Education*, written with her father, in 1798. Her first novel, *Castle Rackrent*, the story of an Irish estate as told by the steward, was published anonymously in 1800. Other works include *Belinda* (1801); *Modern Griselda* (1804); *Leonora* (1806); *Patronage* (4 vols., 1814); and *Helen* (1834). Consult Hill's *Maria Edgeworth and Her Circle in the Days of Bonaparte and Bourbon*; *Chosen Letters*, intro. by F. V. Barry (1931).

Edgren, Anna Carlotta, Duchess of Cajanello (1849-92), Swedish novelist and dramatist, born in Stockholm. In 1872 she married G. Edgren, and in 1890 the Italian Duke of Cajanello. Her works, the earliest of which were published under the pseudonym 'Carlot,' include: fiction—*By Chance* (1869), *From Life* (1882-3), *A Summer Story* (1886), and *Woman and Love* (1890); dramas—*The Actress* (1873), *The Curate* (1876), *The Fairy* (1880), *True Woman* (1883), *A Rescuing Angel* (1883), *How Men Do Good* (1885), *The Struggle for Happiness* (with Sonya Kovalevsky, 1887), and *Domestic Happiness* (1891). She also wrote a biography of Sonya Kovalevsky (1892). Consult *Life* by Ellen Key.

Edhem Pasha (c. 1813-93), Turkish soldier and public official. He became an aid to Sultan Abdul-Medjid (1849); and was diplomatic representative to Serbia (1854); Ambassador to Berlin (1876); Grand Vizier (1877); and Ambassador to Vienna (1879-83).

Edhem Pasha (1851-1909), Turkish soldier, commander-in-chief of the Turkish forces during the Græco-Turkish War of 1897, inflicting a series of disastrous defeats upon the Greeks.

Edible Birds' Nests are chiefly composed of the salivary secretion of several species of swift belonging to the genus *Collocalia*. The birds are found in India, the Malay Archipelago, and Australia, where they nest in vast companies in remote, sea-fronting caves. At the breeding season the sub-lingual salivary glands become enlarged and very active, pouring forth a viscid secretion, which soon hardens in the air. The first nests produced in a season are composed almost wholly of this secretion. They are gathered as soon as possible after having been made, and when clean and of the best quality are of high commercial

value. Edible birds' nests are exported especially to China, where they form the basis of a highly prized soup.

Edict, a law or public ordinance issued in the name of the state or sovereign; hence, any proclamation of command or prohibition. The edict was an important part of the law of ancient Rome.



Maria Edgeworth

Edict of Nantes was issued by Henry IV. of France on April 13, 1598, with the object of giving royal recognition and legal status to the Protestant Calvinistic community (Huguenots) in France. This edict gave the Huguenots definite rights of worship, and the right of holding political and judicial office; established a Protestant chamber in the Parliament of Paris, and joint chambers in local parliaments; and otherwise fully recognized the reformed religion. Its revocation by Louis XIV. on Oct. 18, 1685, had the effect of driving hundreds of thousands of loyal French into exile. See FRANCE, *History*.

Edinburgh, city, capital of Scotland, and a county in itself, is situated on the south side of the Firth of Forth. The city is built on a series of ridges; and the disposal on conspicuous sites of its many handsome buildings of classical form, together with its literary fame, has won for it the name of the 'Modern Athens.' Three hundred feet above the valley, on the summit of a rock, stands the famous Castle, the ancient seat of the Scottish kings. The present edifice was erected in the fourteenth century.

The outstanding feature of the *Old Town* is the steep ridge descending from the Castle

Rock to Holyrood, on which the High Street is built. On a lower level of the Rock, above the portcullis gate, is the restored Argyll Tower, the state prison of former days. On the south side is the old Parliament Hall, also restored, and adjoining it is the portion of the buildings, erected in 1555, in which Mary Queen of Scots lived and gave birth to James VI. The Parliament House (erected 1631-40; re-erected 1808) affords accommodation for the Courts of Session and Justiciary, the supreme courts of law. The Parliament Lobby, the former Great Hall to the Scottish Parliament, is a magnificent chamber filled with portraits and memorials of judges and other great luminaries of Scottish law and of Edinburgh society. Holyrood Abbey closes the long thoroughfare to the east, as the Castle does to the west. The King's Park is behind it, and the precipices of the Salisbury Crags and the steep sides of Arthur Seat appear almost to overhang the grey old palace of the Stewarts. Of the South Bridge, opened in 1788, the chief ornament is the University (see EDINBURGH, UNIVERSITY OF).

The opening of the North Bridge across the great hollow that bounded Old Edinburgh to the north was the birth of the *New Town*, a new and stately city, on a regular plan, on the northern hills. Chief among the industries of Edinburgh are brewing and distilling. Publishing, printing, typefounding, paper and ink manufacture, and the manufacture of drugs and chemicals are also conducted on a large scale. Primarily, however, Edinburgh is not a manufacturing town, and education has been called its chief industry. Apart from the University, the Heriot Trust and the Merchant Company control large annual revenues devoted to secondary education; p. 438, 998. The history of Edinburgh can be traced back to the seventh century. It was not until the middle of the fifteenth century, however, in the reign of James II, that the city was officially recognized as the capital of the kingdom. In the time of James IV, when the building of the royal palace of Holyrood was begun, Edinburgh was the seat of a brilliant court. With the name and period of Mary Queen of Scots, the most tragic and romantic incidents in the city's history are associated (see SCOTLAND). In 1603, on the union of the crowns of Scotland and England, the court was removed to London, and the prestige and prosperity of Edinburgh declined somewhat. In the latter half of the eighteenth century Edinburgh became famous as a center of literary and intellectual life. Its university, founded in the

reign of James VI, has acquired fresh distinction by the rise of the medical school; while other departments of learning flourished contemporaneously, as is attested by such names as David Hume, Adam Smith, Principal Robertson, Dugald Stewart, Lords Monboddo, Kames, and Hailes, John Hutton, Sir William Hamilton, and Thomas Chalmers. Henry Mackenzie, Robert Burns, Sir Walter Scott and the two brilliant groups of writers who started the *Edinburgh Review* and *Blackwood*—Jeffrey, Brougham, and Sydney Smith, and Lockhart, Wilson, and Aytoun—brought to a

of *The Edinburgh Review* appeared his brilliant series of historical and critical essays. Publication ceased in 1929.

Edinburghshire, or **Midlothian**, county, Scotland, on the south shore of the Firth of Forth; area, 366 sq. m. Agriculture is one of the leading industries; there are creameries at Craigmillar and elsewhere; and large market gardens near Edinburgh; p. 526.277.

Edinburgh, University of, a Scottish institution for higher education which dates its foundation from the granting of a royal charter by James VI in 1582. The University com-



Historical Pageant at Castle Craigmillar near Edinburgh.

height the fame of Edinburgh in the field of letters; while the names of Thomas Carlyle and Robert Louis Stevenson later added to its luster. Consult J. Grant's *Old and New Edinburgh*; Oliphant's *Royal Edinburgh*; R. L. Stevenson's *Edinburgh, Picturesque Notes*; J. Bone's *Perambulator in Edinburgh* (1926); the corporation's *Official Guide* (1927); W. F. Arbuckle's *Scotland's Capital* (1933).

Edinburgh Review, **The**, was founded in 1802 by Francis Jeffrey, Sydney Smith, F. Horner, and Lord Brougham. It was the first of the great British critical and political reviews; and its advocacy of Whig principles was as unflinching as its literary judgments were trenchant and sweeping. On the political side, Lord Brougham's pen was indefatigable; and on the literary side Jeffrey's pontifical judgments created an effect to which Lord Byron's *English Bards and Scotch Reviewers* bears enduring testimony. In 1825 Lord Macaulay became a contributor; and in the pages

prizes the faculties of arts, science, divinity, law, medicine, and music. Women are admitted to degrees in arts, science, medicine, and music. The University library contains about 300,000 printed volumes and 8,000 mss. The annual enrollment is about 4,000 students. Among the illustrious men who have taught at the University are Sir W. Hamilton, John Playfair, Thomas Chalmers, John Wilson, J. D. Forbes, Colin M'Laurin, Guthrie Tait, William E. Aytoun, David Masson, and George Saintsbury. The names of Monro, Cullen, Gregory, Black, Simpson, Lord Lister, Syme, Goodsir are associated with the medical school. Consult Sir A. Grant's *The Story of the University of Edinburgh*; the University's *Calendar*, 1933-34.

Edison, Thomas Alva (1847-1931), American inventor, was born in Milan, O., of Dutch paternal ancestry. His grandfather was a Loyalist, exiled to Canada after the Revolution; his father was a Canadian revolutionist

of the thirties, reëxiled to the United States, and finally settling in Port Huron, Mich.; his mother was a schoolmistress of Scotch and Quaker blood, of keen intellectual interests, who trained at home the boy reputed to be 'addled' at school. Fascinated with chemistry, and filling the cellar with chemicals, he became by choice, at the age of fourteen, a railway newsboy for leisure and money to experiment.

He kept his laboratory in the railway baggage car till an accident to it caused a fire and led to its ejection. His deafness arose from being lifted into a car by his ears. He also carried provisions and ran terminal grocery stores, published a train newspaper, learned telegraphy and at sixteen became a night operator. He then began a five-years tramp as a roving telegrapher, West and South, during and after the Civil War.

In 1868 Edison went to Boston where he attracted notice as the Western Union's fastest operator. He there invented his first machine, a vote recorder; also the first quadruplex telegraph, which was sold to the Western Union. In 1869 he went to New York, and became superintendent of the Gold and Stock Telegraph Co.'s plant, where he devised several other inventions, and the company bought him out for \$40,000.

With the aid of this money, Edison established works in Newark, N. J. (removed to Menlo Park, N. J., in 1876), where, among other inventions, he developed automatic telegraphy; improved the quadruplex and sextuple telegraph; devised the mimeograph; and improved the first typewriter (Sholes') into a practical machine. At one time, forty-five inventions were under experiment. In 1876 he invented the carbon transmitter which made the new Bell telephone a commercial success. The phonograph was invented by Edison and made public in 1877-8. Perhaps the greatest of Edison's inventions was the incandescent lamp. In 1929 the Golden Jubilee celebrating the 50th anniversary of the invention of the incandescent lamp was observed with appropriate ceremonies throughout the world. The United States Government issued a special postage stamp in honor of the occasion. Next to the incandescent lamp Edison's most important contribution to public life was probably his development of the old kinoscope into the present moving picture system, which is based on his patents, and which is constantly evolving new and amazing possibilities. (See MOVING PICTURES.) He was the first to design and operate an electric rail-

way from a central station. Improved dynamos and high-speed steam engines are other contributions to science.

During the war (1914-18) he designed and operated benzol plants, carbolic acid plants and chemical plants for making myrbane aniline oil, aniline salt, and other chemicals. Highly honored in America, Edison was no less so abroad. The great Lord Kelvin was his enthusiastic admirer. He was twice married—to Mary Stillwell (1873-84), and Nina Miller (1886), and had four sons and two daughters.

Consult F. L. Dyer and T. C. Martin's *Edison: His Life and Inventions* (rev. ed. 1929); Meadowcroft's *The Boy's Life of Edison* (1928); H. Ford's *Edison As I know Him* (1930); F. T. Miller's *T. A. Edison* (1931).

Edmonton, city, Canada, capital of the Province of Alberta, on the North Saskatchewan River. The Provincial Parliament buildings are here, and a number of educational institutions. The city is the center of a rich agricultural and coal mining district; the Edmonton, Dunvegan and British Columbia and Alberta and Great Waterways Railways bring to it products of the Peace River and the Athabasca and Mackenzie River districts, comprising fish, timber, minerals, and fur; and it is an important depot for the fur trade of Northwestern Canada. Industries include meat packing, brick yards, saw and flour mills, clay products, foundries and machine shops, creameries, grain elevators, and cigar, candy, shoe, biscuit, metal goods, box, mattress, and clothing factories; p. 79, 197.

Edmund I, the Magnificent (c. 922-46), succeeded his half-brother Athelstan as king of England in 940. Consult Green's *Conquest of England*.

Edmund, Saint (?1170-1240), English ecclesiastic. He was commissioned by the Pope to preach the sixth crusade throughout England. In 1234 he was appointed archbishop of Canterbury. He stood forth as the champion of the national church.

Edmund Ironside (?981-1016), king of England, the son of Ethelred the Unready, succeeded his father in 1016. Only London acknowledged him as king, the rest of England accepting the rule of Canute. For some months Edmund engaged in the hopeless task of attempting to recover England from the Danes. By the treaty of Olney, Edmund received Wessex, East Anglia, Essex, and London, while Canute held Northumbria and Mercia.

Edmunds, George Franklin (1828-1919), American lawyer. From 1866 to 1891 he was a member of the U. S. Senate, and dur-

ing that period served on many important committees, especially the Judiciary Committee. In 1897 he was chairman of the Indianapolis Monetary Conference.

Edom, an ancient district to the s.e. of Palestine, between the Dead Sea and the Gulf of Akabah. It embraced a strip of land 100 m. long and 20 m. wide, for the most part mountainous and barren, but with occasional stretches of fertile land. The original inhabitants were the Horites, or cave dwellers. The Edomites refused to permit the Hebrews to pass through their country on the way to Canaan, and the antagonism between the two peoples lasted almost to the Christian era. The language was akin to Hebrew, and the religion polytheistic.

Edrisi Mohammed, or **Ibn Mohammed al Idrisi** (1099-1170), Arabic geographer, was born in Ceuta and educated at Cordova. Subsequently he travelled in Asia Minor, Italy, Greece, and Spain; and resided for some time in Sicily where, at the request of King Roger II, he constructed a silver celestial and terrestrial globe. The King invited him to write a description of the earth founded upon direct observation; and for that purpose travelers were sent on journeys of exploration. The collection of this material occupied many years, and Edrisi's *Description of the World* (*Nuzhat-el-Mushtâk*), or 'Book of Roger,' as it was also called, is one of the most important geographical contributions of the early middle ages.

Education, in the ordinary use of the term, includes the instruction of the youth of the race by adults. Since the beginning, those to whom children have been born have helped them. For a longer or shorter period they have kept their children with them, and unconsciously or with intent have familiarized them with the things they cared for. As man slowly developed into a creature with purposes, he began to give commands, advice, and criticism, and with them ideals were born. The fact that the generations do not appear on the earth one after the other, but both live together for a time, in telescope fashion as it were, is the basis of all education. Education has grown out of the parents' care for the child, and represents the effort to bring it to pass that the young shall learn to do the things which those older have found that they must do in order to live, and to do them with somewhat the same motives as directed their elders.

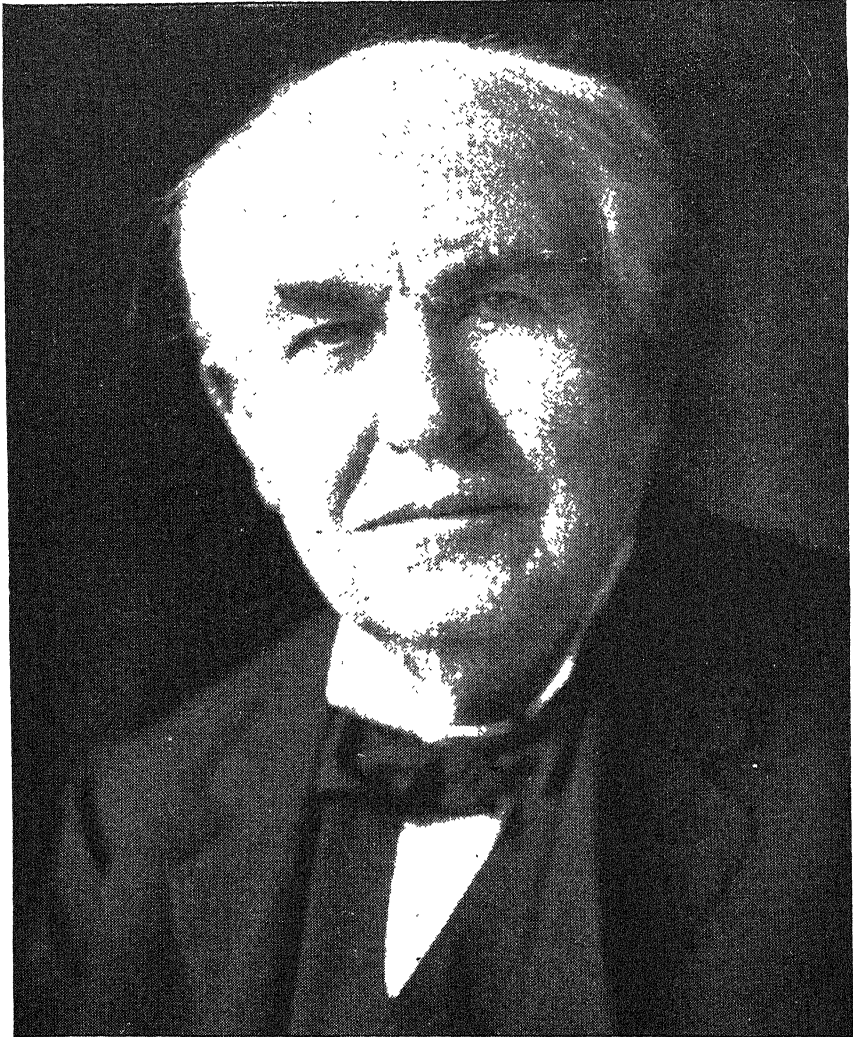
Other definitions are frequently given—as, for example, that education is the imparting of

knowledge, the theory being that those who have it, give it to those who do not have it. This view of education, however, overlooks the fact that knowledge is made up of thoughts, not of material objects to be handed about or shared with others. The task of education, therefore, seems to be not to impart knowledge or to reconstruct minds, but to put people in the way of using the minds which they already have in ways that are helpful to themselves and to their fellow men. To provide opportunities for the young to learn to use their own minds in socially profitable ways in the generating of their own thoughts, their own points of view, and their own skill has, therefore, been the generally accepted notion of what education is, throughout history.

Histories of education usually contain brief passages on educational practice in China, India, Babylonia, and Egypt, but it is their author's desire for enumerative completeness, rather than to present what is really significant to men of our day, that gives these subjects a place in his book. Western education began at Athens. It was at Athens that most of the features of our present day school system first took form. If we study Egypt and Babylon, it is because their peoples were so strange and unlike our own: we study the Greeks for exactly the opposite reason, because they were like ourselves, because they were our ancestors. After Athens comes Alexandria with its museum and its library. Then the period of Roman education begins. Next Christianity appears, and pours its message into the thought forms of the Greeks. Then ensues a long period of darkness, in which schools almost everywhere cease to exist. Then comes the Lesser Renaissance of the 12th century, the rebirth of antiquity which puts an end to the dark age and creates the modern university. The spirit of the Greeks and Romans is not yet alive in the West. The Greater Renaissance calls it back to earth again, and the era of Humanism is on. The Greater Renaissance contributes new studies and the secondary school. Humanism crosses the Alps to Germany and there becomes the German Reformation. There is a form of learning now which is indispensable to every one, and the elementary school which all must attend springs into being. Then follows the great secularizing movement which is called the Revolution. We are still living in that period. These are the several periods in the history of education. If we examine them closely, we shall see that throughout its entire history education has been the means which the people of

every age have devised for realizing the kind of life which they regarded as the best, and through the work of school sought to attain for their children. The school is therefore the agency through which the peoples of the world have striven to make their ideals of life

ways created to accomplish a definite task, we cannot understand it in any age or among any people without first finding out what they were most concerned about, and what they were trying to bring to pass in their part of the earth.



Thomas Alva Edison.

realities in the person of the young. Education is not, therefore, an activity unrelated to the other activities of the time and place in which we find it. It is always the agency of the dominant social interest. Since it is al-

Sparta is the most remarkable example in history of a state organized for the purpose of making war. Spartan education is the device adopted to bring their children up as soldiers. The training of the young was a

state affair, and most jealously watched by every Spartan. When the lad was seven years old he left home and joined a boys' gang. Henceforth he lived in barracks, and played and wrestled and fought and drilled with the other boys of his gang, under the direction of a boy gang leader. Aristotle did not regard their education as a success: 'For they make their children brave by painful trials, thinking that that is the way to develop courage. But education should not be directed, to this or to any other single end.'

The *Athenians* brought up their children to their way of life. 'The greatest discovery ever made by man,' says Sir Henry Jones, 'was made by the Greeks when, cutting themselves free from the traditions of the ancient world, they alighted upon the conception of a civil state where citizens should be free. The most momentous experiment of mankind is that of carrying out their conception to its ultimate consequences in a true democracy.' The Athenian way of life is the invention of Solon, the shaper of the Constitution. He set aside the ancient classification by birth, and arranged the Athenians in four classes according to their incomes. The archons could be selected only from the first class. The other offices could be filled from the three highest classes, for they alone at that time had the necessary education. All Athenian citizens were to share in the election of officers, and at the expiration of his term each officer was required to give an account of his stewardship to an assembly made up of all the citizens of Athens over thirty years of age. This device, the review, is in some respects Solon's greatest invention, and is peculiar to his laws. Eligibility to all the offices was extended to every citizen at a later date at Athens. To carry on this scheme of life it will be seen that education of all her citizens was the foremost necessity of Athens. To be a citizen meant to be able to read and write. The Athenian lad from the age of seven was taken daily to three schools: to that of the grammarist where he learned to read, write, count, and recite Homer; to that of the lyre-master or citharist, where he was given instruction in chanting lyric poetry and in accompanying himself on the lyre; and to the palaestra of the pædotribe or boy trainer, where he was given his lessons in physical training. He left these schools, on the average, at about the age of fourteen; thereafter went to the gymnasia for physical training; at eighteen he took the Solonian oath, and joined the ephebi; and after spending two years in military drill he graduated.

This was the older education of Greece. With the great expansion in the life of Athens in Pericles' day, new teachers of more advanced studies came, promising to teach young men what they called 'the art of life.' Socrates (469-399 B.C.), spent his days in searching for clear notions as to what a man should do and be, and how he might fit himself for it. He employed the *Socratic method*, and he is the greatest of secular teachers. His pupil, Plato (427-347 B.C.), devoted his life to the same inquiry. He wrote the immortal *Dialogues* which show Socrates, his master, at work, and outline Plato's own philosophy. About the year 387 B.C. the latter opened a school for the study of philosophy at Athens—the *Academy*. It is the first college or university of the West, and the work of instruction which Plato began continued on in it, in some form or other, until the year 529 A.D.

Plato's pupil, Aristotle, about the year 334 B.C. founded another college at Athens—the *Lyceum*—and taught in it for nine years. He, too, gave the work of instruction which he began a mighty momentum, for his school continued for some seven hundred years.

The *Romans* were in a crude stage of development at the time when the life of Athens was at its best. There is some evidence, however, that instruction in reading and writing was given at Rome as early as the time of the kings. Because of the peculiar character of the Roman religion, education was a family responsibility at Rome. The thing which the Romans were most insistent that their children should know and do was their duty to their parents and to the state. They were taught reading, writing, a bit of numbering, and to recite the law of the Twelve Tables by heart. The significant thing about later Roman education is that it was imported from Greece, and that the organizing ability of Rome was employed to make for Greek education as permanent a place in the world as Roman institutions themselves had. Religious borrowings had been made from Greece at a very early date. As time passed, these borrowings increased in extent. Schools for the teaching of Latin grammar and rhetoric were opened at Rome about the year 100 B.C. *Cicero's De Oratore* and *Quintilian's Institutes of Oratory* furnish the best accounts of Roman education that we possess.

With the coming of *Christianity* great changes took place. The Old World was full of schools and teachers; but they were pagan schools, and their books were full of stories about the pagan gods. Christian schools must

be opened, and the pagan schools must be closed as rapidly as the people can be converted from the error of their ways. The first schools are catechism schools for teaching the elements of the new faith to those who are preparing for baptism. Another kind is needed to train up priests or preachers. These are conducted in the bishop's palace, and are consequently episcopal or cathedral schools. And as men retire from the world and band themselves together to lead the religious life, schools are opened by them in the monasteries to teach the neophytes the things which they should know—religious things. Secular studies are almost forgotten now; but the Latin language is the language of the Church in the West, so some attention must be given to learning Latin.

The barbarians invade the Empire. Almost everywhere the schools are closed, but the Church goes on with its work as bravely as it can. There is one corner of Europe which the invaders do not overrun, and whose life they do not overturn. That land is Ireland. Ireland led Europe in schools and culture in the sixth, seventh, and eighth centuries. England shares that distinction with her in the eighth century. In 768 Charles the Great came to the throne of Frankland, and later began to dream of restoring the Christian Roman Empire of Constantine. He employed a young English teacher Alcuin—who when the invitation came to him was at the head of the school of York—to help him in his work of establishing a system of schools in Gaul and reorganizing the church of his realm. A school for the princes and the sons of his courtiers was founded in his palace, which the King himself attended, as well as his wife and daughters. This Palace School accompanied the person of the monarch to whatever part of the kingdom he made his headquarters. The King and his untitled minister of education soon set about the vast undertaking of causing schools to be maintained in every cathedral and monastery in the realm. The King planned universal provision for education; but his son Louis the Pious was too weak to carry his plans to fulfilment. Similar efforts were made by King Alfred in England, but they, too, almost immediately came to nothing. In the latter part of the eleventh century two events took place of the greatest significance for the revival of learning: one was that a teacher began to teach the Roman law in the city of Bologna in Italy (in 1888 the University of Bologna celebrated its eight hundredth birthday); the other was that the

great teacher Abélard (1079?-1142) was born in Brittany. So many thousands of students assembled to the teaching of Abélard at Paris that a guild of masters was formed, shortly after his death, for the mutual protection of the teachers who assembled there. This trade union of masters, when granted articles of incorporation and special privileges by kings and popes, became the University of Paris. Other universities were formed very soon afterward—Oxford and Cambridge, Padua, Montpellier, Salamanca. Thus came about that first revival of the past which is called the Lesser Renaissance.

The period in which men found their own strength, and consciously set about trying to do the same sort of creative work that the men of Greece and Rome had done, is called the Greater Renaissance, or the period of Humanism. It began in Italy, and Petrarch (1304-1374) was its prime mover. He wrote its programme, and the men whom he influenced carried it out. They learned from him to devote themselves to four tasks: the production of literature based upon classic models, the veneration of Cicero as the perfect master of Latin style, the collecting of all the manuscripts of antiquity that could anywhere be found, and the revival of the study of the Greek language and literature.

This is the *Revival of Learning*. The ages of blind domination are over. Man learns that he is free, and that the way to prepare for the next world is by using his life here most effectively. New kinds of schools are needed. Vittorino da Feltre (1378-1446) founded one at Mantua. Erasmus writes new text books. The Lesser Renaissance produces the University, the Greater Renaissance transforms it and creates the secondary school.

The new learning and the new spirit cross the Alps into Germany, and the Reformation soon begins. Every one must now read the Bible for himself, and to do so every one must be taught. The desperate necessity laid upon each individual of acquiring sufficient knowledge to save his own soul is perhaps the only motive which could have operated in the undemocratic Europe of that day to make universal education not indeed a reality, but a national ideal. Protestantism must have three kinds of schools: (1) Testament schools, in which every one may learn to read the Bible; (2) secondary schools, where the languages are studied; and (3) universities for training ministers in Latin, Greek, and Religion. Harvard College, founded in 1636, is the first American edition of the European

Protestant university, as the Boston Latin Grammar School of 1635 is the first American representative of the humanistic secondary school.

Thus we trace the beginning of the American school system back through Protestantism, to the Italian Renaissance, and through it to the schools of Greece. The last period, that of the Revolution, is due largely to ideas of which Rousseau was the chief expounder. 'Man is born good.' Institutions and convention make him bad. The state is one of these institutions, Rousseau thought. Education is another. Largely because of his preaching, men created the new democratic state, and largely because of his preaching they have and are creating a new democratic education. 'Study the child,' said Rousseau, 'for it is clear that you know nothing about him.' The result is the psychological education of our day, the outlines for which have been furnished by Rousseau's disciples, Pestalozzi, Froebel, and Herbart. The Revolution produced the new social life in which civic education for every one is demanded, and the Revolution roused men to study the ways and means by which man can acquire control of the tools of social life. For an account of the History, Development, and Present State of Education in the United States, see the special article. EDUCATION IN THE UNITED STATES. For Canada, see EDUCATION IN CANADA.

Further important information on education will be found in the articles on EDUCATIONAL SYSTEMS, NATIONAL; PEDAGOGY; UNIVERSITY. In addition, see the section on *Education* in the articles on the different countries and States, and the separate articles on universities and colleges. See also the following:

Apperception.	Medical Inspection of
Architecture.	Schools.
Arnold, Thomas.	Memory.
Attention.	Military Education.
Blind, Training of the.	Monasticism.
Chautauqua Institution.	Montessori, Maria.
Children, Delinquent.	Music.
	National Education Association.
Co-education.	Nautical Schools.
Comenius, J. A.	Normal Schools.
Commercial Education.	Pestalozzi, J. H.
Curriculum.	Physical Training.
Dewey, John.	Polytechnic Schools.
Eliot, C. W.	Psychology.
Emotions.	Public Schools.
	Reformatories.

Evening Schools.	Renaissance
Forestry.	Rousseau, J. J.
Froebel, F. W. A.	Scholasticism
Gardening.	School Administration
Herbart, J. F.	Schools of Art.
Industrial Education.	Schools of Engineering.
Kindergarten.	Schools, Private
Legal Education	Spencer, Herbert
Locke, John.	Technical Education.
Mann, Horace.	University Extension
Manual Training.	Vocational Education
Medical Education.	Women.

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Centered School (1928); F. W. Roman, *New Education in Europe* (1930); H. H. Horne, *This New Education* (1931); *Radio and Education*, L. Tyson, ed. (1931); I. L. Kandel, *Comparative Education* (1933); H. L. Hollingworth, *Educational Psychology* (1933); *Contributions to Education of Teachers College*, Columbia Univ., and *Educational Yearbooks*, International Institute of same.

Educational Systems, National. Australia and New Zealand.—Each state of the Australian commonwealth controls, regulates, and supports public education within its boundaries, under a Minister for Public Instruction and a director of education. Primary education is free, compulsory, and secular. Secondary education is largely taken over by private enterprise, though the states maintain some secondary and technical schools. There are universities at Sydney, Melbourne, Brisbane, Adelaide, Perth, and Hobart. The Education Department of New Zealand, headed by the Minister of Education, has general supervision and control of primary, secondary, and technical education. Primary education is free, compulsory, and secular. Secondary schools charge a moderate fee but maintain many free scholarships; there are also free high school departments in many primary schools. There are special schools for natives. The University of New Zealand consists of Otago University and Canterbury, Auckland, and Victoria University Colleges.

Austria.—After the World War, with the transition from a monarchy to a republic, there were consequent changes and reforms in the educational system. The Minister of Education directs the system. Primary education is free and compulsory from six to fourteen, although there are some exceptions for children of twelve. The state, provinces, towns, or private individuals support the *Gymnasien*, with an eight-year course; the *Realschulen*, seven-year; and the *Realgymnasien*, with a four-year course for students not intending to enter the universities or higher technical schools. There are three universities, theological colleges, and technical high schools.

Belgium.—Public instruction is directed by the Minister of Education. Primary education became compulsory only in 1914, and is free for children of six to fourteen. Each commune must have at least one primary school, which it supports with aid from the state and province. Higher education is furnished by state high schools, royal athenaeums, special athenaeums, communal and

provincial colleges, private colleges, lycées for girls, and five universities. See BELGIUM, *Education*

Denmark.—Education is under the nominal control of the church, bishops and clergy assisting in school administration. The head of the system is the Minister of Ecclesiastical Affairs and Public Instruction. Education is compulsory from seven to fourteen, and in state schools primary education is free. For the first five school years all receive the same education. After this period those intending to pursue secondary education enter a middle school, for four years. From this the student passes on either to a one-year *real* course or the gymnasium for three years, which prepares for the university. There are also technical schools, teachers' training colleges, adult schools, a veterinary and agricultural college, a Royal academy of arts, a polytechnic institution, the University of Copenhagen, and the University of Aarhus. Denmark's great contribution to education, however, and probably the strongest factor making for her general popular culture are the folk high schools. These are for young men and women past eighteen who have not been in school for a number of years following the elementary period; they have no entrance examinations and give no certificates for work done.

France.—France's educational system is well organized and centralized. The public schools, primary, secondary, and superior, form the University of France. In charge of this is the Ministry of Public Instruction, aided by the Superior Council and Inspectors-General and Inspectors. For local administration there are seventeen circumscriptions (academies), each with an academic council, which deals with all grades of instruction, and each under a rector, who has an academy inspector for each department in his district (except Nord—2, and Seine—8), and also primary inspectors for each *arrondissement*. Each department has a council for primary educational matters, with the prefect as its president; and each department must maintain a primary normal school for men and another for women. Education is compulsory and free from six to thirteen; there are a great number of infant schools (*écoles maternelles*). Teachers are lay.

Secondary education is offered by the state in the lycées, by the communes in colleges, by associations and private individuals, and in free establishments (*écoles libres*); the course of study is seven years. There are seventeen universities in France; they were organized by

the laws of 1890 and 1896. The right to confer degrees is reserved to state faculties, but the universities themselves grant diplomas and certificates. There was a total of 87,269 students in the universities in 1935 and nearly six million students in the 89,911 lower schools.

Germany.—Education is almost wholly in the hands of the individual states, rather than with local communities. Educational administration in each state is centralized under the minister of public instruction or some similar official. There are local or communal bodies for matters of external administration, and in the larger states intermediate school boards, usually appointed by the central authority.

Changes in the nation's political structure after the World War were of course reflected in its educational philosophy; again, after the Hitler revolution, nationalism in education was stressed and at the same time a strong discrimination against Jews, in schools and universities, was exercised. The trends which the changes in the political régime introduced have evidenced themselves in a sharp curtailment of students in universities (over 40 per cent. decline) and a drastic readjustment in the curricula which now teaches exclusively the Nazi views in the social sciences. Early in 1936 the university term was reduced by a year through the elimination of some vacations. Later the term in the gymnasium (high school) was reduced one year to allow students to devote this time to the military labor service. The number of university teachers decreased sharply as well.

Great Britain.—In England and Wales, education is administered under the Acts of 1899 and 1902. Central administration rests with the Board of Education, created in 1899. The permanent staff includes a secretary general, an accountant-general, three assistant secretaries, a director of special inquiries and reports, and a chief inspector for each of the three branches of education.

By the Act of 1902, local administration is vested in county, borough, and urban district councils. The local authorities are charged with the duty of generally maintaining and keeping efficient all public elementary schools within their area. All elementary schools are aided by state grants and by tax rates levied by local authorities.

Elementary schools include infant schools, schools for children from eight to fifteen, and higher elementary schools, in which provision is made for vocational training. Secondary

education is provided for in endowed schools, such as the famous public schools of Eton, Rugby, and St. Paul's; in proprietary schools, maintained by stock companies or on a corporate system; in private schools; and in municipal schools. Technical training is given in evening continuation schools, and in trade schools of the apprenticeship and pre-apprenticeship type.

Higher education is provided by universities, university colleges, and professional schools. The older type of English university is represented by Oxford and Cambridge. The newer universities are quite distinct in character, emphasizing science and technical training, and making provision for evening instruction. They include the University of London, and universities at Manchester, Liverpool, Leeds, Birmingham, Sheffield, Bristol, Durham and Reading. There are university colleges at Newcastle, Nottingham, Reading, and Southampton. The central institution for professional education is the Imperial College of Science, a federation of associated colleges incorporated in 1907.

The educational system of Scotland is similar to that of England before the Act of 1902, which did not apply to Scotland. General control of education is vested in the Department of Education; in local boards in each parish and burgh, elected by the local rate payers; and in secondary education committees, elected or nominated by local and district public bodies. Education is free and compulsory. Continuation courses—commercial, industrial, rural, and domestic—are also provided. Practically all schools receive state grants. The Scottish universities are organized on Continental models. In 1937, England and Wales had a total of 20,854 schools, exclusive of universities, with an average attendance of 4,907,435 pupils.

In the *Irish Free State* one of the first acts of the Government was to unify control of primary, secondary, and endowed schools under a Minister of Education. The First Conference of Educationalists in 1920 drafted a program in which the chief purpose was to imbue children with a consciousness of Irish national culture, with Irish as the language of instruction, a later conference, in 1926, recommended that the transition to Irish be gradual and that English be employed where necessary.

The appointment of teachers is in the hands of the religious denominations; parents may refuse to send their children to a given school on religious grounds. Primary educa-

tion became compulsory in 1926, from six to fourteen, and is free although the minister may raise the age limit to sixteen. There is a National University and the University of Dublin.

Italy.—The educational system is headed by the Minister of National Education. Elementary education is free and compulsory up to fourteen. This is classified as preparatory, in 'maternal schools' (*asili*), a three-year course financed by the municipalities; lower schools, three years; and higher, two years. Secondary education is in two grades: the gymnasium (*ginnasio*), the preparatory course for teachers, the preparatory course of the technical institute and the professional schools; and the classical lyceum (*liceo classico*), lyceum for science, higher course for teachers, higher technical institute, academy of arts, lyceum for arts, and the *Conservatori di Musica*. Higher education is provided in the Royal universities and higher institutes and in the free, self-supporting, universities and free higher institutes. As the program of Mussolini unfolds, it dominates more and more the educational program, shaping it to the ends of the state. A program announced in 1934 organizes boys from eight years old up along semi-military lines.

The country has 26 universities with a total of 40,000 students in 1937. Illiteracy, which was especially high in the southern part of the country, was considerably reduced.

Japan.—The educational system dates from 1872, and is based on European models. Education is controlled by the state and is under the general supervision of the Minister of Education and the High Educational Council.

Norway.—The educational system is controlled by the Minister for Education and Ecclesiastical Affairs. Education is compulsory from six or seven to fourteen. Public elementary schools are supported locally and by the state. The communes, the state, and private individuals finance secondary education. There are also normal schools, a technical high school, an agricultural high school, a teachers' training college, a dentist high school, a state academy of arts, a university at Oslo, a continuation school for youths of from fifteen to eighteen, and technical, industrial, crafts, and arts schools.

Portugal.—The Minister of Education heads the educational system. Primary education is compulsory. Infant schools instruct children of from three to six years. There are also secondary schools, primary normal schools, special colleges for music and art, a

military academy, a naval school, commercial, agricultural and veterinary schools, and three universities.

Russia.—Education is in the hands of the Commissariats for Education of the Constituent and Autonomous Republics of the U. S. S. R.; the higher educational and scientific institutions in the autonomous republics, however, are subordinate to the Commissariat for Education of the Union Republic of which they form an autonomous part. Education is compulsory, secular, and co-educational. The schools are of various types. Institutions for social training are classified as primary schools, seven-year, secondary, for peasant youths, for youths older than school age, and schools for the mentally deficient. Professional and technical institutions are: higher schools, workers' faculties, technical high schools, vocational training workshops, factory training, workers' education, and other vocational courses and schools. In view of the urgent need for specialists, the system of higher education was reorganized in 1929-30, and universities and institutions formerly of more general nature were classified and consigned to the control of corresponding economic institutions; thus, higher institutions preparing agronomists were taken over by the Commissariat for Agriculture, etc. School education is increasingly technical.

Since 1934 there has been a reversal of previous educational trends in the country. Disciplining of pupils has been reintroduced in all schools, and there is now more emphasis on Russian history and classical literature. Illiteracy continues to decline steadily. In 1937 the country had 170,000 schools with 26,000,000 students. In 1943 coeducation was discontinued in the high schools of some large cities and industrial centers.

Spain.—The educational system is headed by the Minister of Education. The Republican Constitution makes primary education compulsory and free. Although education is lay, the churches may, under state inspection, teach their doctrines in their own schools. The country is divided into eleven educational districts with the universities as centers. Secondary education is conducted through state schools (*institutos*), of which there must be at least one in every province. Girls are educated chiefly in convents and private schools.

Switzerland.—Under the constitution primary education is compulsory, and the cantons are required to provide free elementary

schools. State grants are made but each canton conducts its school system independently. Industrial and commercial education receive special attention. There are seven universities and the federal government maintains a technical high school at Zurich.

Union of South Africa.—Upon the formation of the Union in 1910 the central authority took over university education but left the other branches to the provincial authorities for a period of years. Primary education is compulsory except in a small section of Cape Colony and is free in all provinces. Secondary schools are maintained or aided by the government. By legislation of 1916 three universities were established to take the place of the University of the Cape of Good Hope, which was converted into a federal university called the University of South Africa; there are five constituent colleges.

United States.—See separate article, EDUCATION IN THE UNITED STATES.

Education Association, National. See **National Education Association.**

Education in Canada. Subject to the condition that they may not curtail the rights and privileges in the matter of denominational or separate schools held by the Protestant or Roman Catholic minority at the time of Confederation or of admission to Confederation, the provincial legislatures create and administer the schools of Canada. Through its legislature each province has created at its capital a central authority, or unit of control, in education. Each provincial legislature has created local authorities or units of control which, subject to restrictions imposed by the legislature, direct such educational activities as may not be directed efficiently by a central authority. Apart from a very few private residential schools in the urban centers, the schools of Canada are public, or state, schools. All state schools except those of Quebec and some high schools in Ontario and the Eastern provinces, are free schools. Where fees are charged at all, they are nominal. Attendance is compulsory in all the provinces except Quebec.

A vigorous central authority has given to each provincial school system a professionally trained staff of teachers and inspectors, an effective, if not unique, adjustment of primary school to secondary, and of secondary school to higher, and a remarkable uniformity in schools and school subjects. Separate or denominational schools for religious minorities exist in one form or other in all provinces except British Columbia. In Quebec, and to a

less extent in Ontario, this means, so far as it goes, a dual system of state schools. Most of the provinces have had the 'language' problem in their primary schools. In a general way these provinces have sought to solve the problem by permitting the instruction of non-English pupils in their own language only when they have received adequate instruction in English.

Education in the United States. *Historical.*—The history of education in the United States falls into four well-defined periods, each becoming more characteristically national, each increasingly expressing a response to native demands, and each embodying this nation's ideals to a greater extent. The first period is one of transplantation of European institutions, and covers the century from 1640 onward. The second period, from the middle of the 18th century to about 1830, is marked by a decline due to new immigration, the growth of wealth and materialism, and a transition from aristocracy to democracy. The third period, from 1830 to 1890, was an era of consolidation, marked by the development of municipalities, the rise of industries, and the absorption of new population. The fourth period is that of the present.

The Colonial Period was marked by efforts to transplant the educational systems and ideals that the colonists brought with them. The earliest educational legislation required the authorities to apprentice orphans and the children of poor parents, and to train them up to some honest trade. This introduced both in Virginia and in Massachusetts the idea of state interference, accompanied at different stages by voluntary contributions, by forced contributions, and by compulsory assessments for the maintenance of the system. But the interest in Virginia was short-lived: the population was too scattered and the outlook too aristocratic to develop a public system. Greater activity was shown in Massachusetts, however. There Harvard College was founded in 1636. The influences of the Reformation may have been responsible for the more comprehensive law of 1647, by which, 'it being one of the chief projects of that old deluder Satan to keep man from the knowledge of the Scriptures,' every township of fifty householders was required to appoint a teacher of reading and writing, and every township of one hundred householders to establish a grammar school to fit boys for the university. As a rule by 1715 schools were maintained out of rates and public funds.

In New Netherlands the connection between

the school and the church was even closer. The West India Company sent the schoolmaster to New Amsterdam. In Maryland the principle of local effort with State support seems to have been proposed. Although nothing was actually done for some years, a law was passed in 1695 for the establishment of free schools in each county, the colony paying the salaries of the teachers, and the schoolhouses being provided by local tax. The same principle was proposed in South Carolina in 1712, but was not put into effect until 1722. There was thus wide variation in practice among the early colonies. But however great the differences in organization and administration, there was much similarity in the types of schools. The elementary schools, which soon came to be taught by women (whence the term 'dame school'), confined themselves to teaching the elements of reading and writing. The hornbook, New England Primer, Psalter, and Bible were the usual text-books. Pupils who wished to learn arithmetic, and sometimes even writing, were compelled to resort to the writing and ciphering master. To these schools girls were admitted, as a rule. The grammar schools used the methods, and not infrequently the text-books, of the English schools. The attention was concentrated on the classics and religious instruction, the goal being admission to the colleges. As a rule girls were not admitted to the grammar schools.

The 18th century brought marked changes. The population was gradually dispersing, and becoming settled in small groups over a larger area. This resulted in the development of local autonomy, but it also reduced the amount of money available for education. The changed conditions called for a new type of secondary school that would give training in other than classical subjects. The academy arose under the contributory influence of the English dissenting academies and Benjamin Franklin's plea for a modern school to meet contemporary requirements. As a result, the Public Academy in the City of Philadelphia was opened in 1749, and was soon followed by a number of others, including Nazareth Hall at Bethlehem, the Phillips Academies at Exeter and Andover, Groton and Erasmus Hall—all giving a broader curriculum than the grammar schools, none of them bound by college entrance requirements. In the Middle West, many of the academies obtained State aid, and further extended the idea of the close relation of the State to education. In

New York they became associated with the training of teachers.

In this period were also laid the foundations for the higher education of girls. Some of the academies were coeducational, but many were for girls only. After the early experiments, at the close of the 18th century, the best known are the Troy Female Seminary, opened by Emma C. Willard in 1819; the academy of Catherine Beecher at Hartford, Conn., opened in 1822; and the Ipswich Academy of Miss Grant, opened in 1828. This movement was to lead, in the next decade, to the establishment of women's colleges. Education receives no mention in the Constitution, but is left to the various States; nor did the early State constitutions make any provision. The interest of the period seems to have centered mainly in higher education. The beginning of the 19th century coincided with a movement in the direction of centralizing State systems of higher education. Thus, the University of the State of New York was established in 1784, under a Board of Regents, who in 1812 appointed the first State superintendent of common schools; that of Georgia in 1785; of Louisiana in 1810; of Indiana in 1816; of Michigan in 1817; of Illinois in 1819. Elementary education was in general left to local or private effort; and in the larger cities a number of free school or public school societies sprang up for the establishment and conduct of elementary schools for the poor.

The great social and economic changes of the first half of the 19th century, leading to the development of large cities, combined with the newer educational ideas in the establishment of public systems of education. The stimulus came from a few leaders—notably Horace Mann in Massachusetts, and Henry Barnard in Connecticut. In 1837 a State board of education was organized in Massachusetts, with Mann as secretary. He set himself the task of instructing the public in the needs of education through his reports, and of training teachers through the establishment of normal schools and an educational journal. Barnard in 1838 became the secretary of the Connecticut Board of Education, and performed a similar service for that State. Massachusetts and Connecticut served as examples for the rest of the country. The development of city educational organizations was contemporaneous, and the beginning of the public school systems was marked by the appointment of city superintendents of schools,

EGGS OF AMERICAN BIRDS

PLATE II

- | | |
|----------------------------|-----------------------------|
| 1. LONG-BILLED MARSH WREN | 13. BLUE-GREY GNATCATCHER |
| 2. CHICKADEE | 14. WHITE-BREASTED NUTHATCH |
| 3. BUSH TIT | 15. WOOD THRUSH |
| 4. BROWN-HEADED NUTHATCH | 16. ABERTS' TOWHEE |
| 5. HOUSE WREN | 17. BENDIRE'S THRASHER |
| 6. SHARP-TAILED SPARROW | 18. OLIVE-BACKED THRUSH |
| 7. BANK SWALLOW | 19. BLUE GROSBEAK |
| 8. GOLDEN-CROWNED KINGLET | 20. CARDINAL |
| 9. BARN SWALLOW | 21. MOCKING BIRD |
| 10. SONG SPARROW | 22. CATBIRD |
| 11. ROSE-BREASTED GROSBEAK | 23. BROWN THRASHER |
| 12. BLUE BIRD | 24. ROBIN |
| | 25. CALIFORNIA THRASHER |



1



2



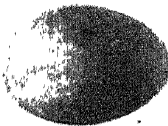
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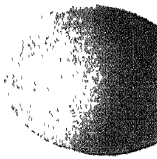
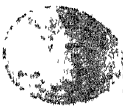
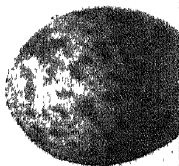
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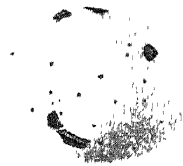
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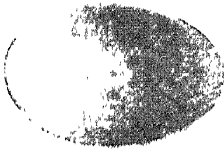
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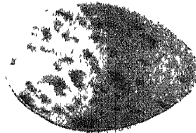
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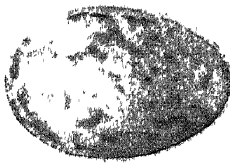
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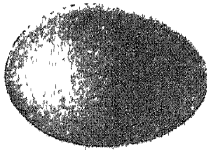
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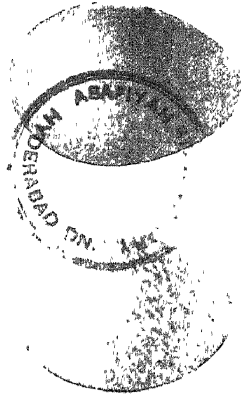
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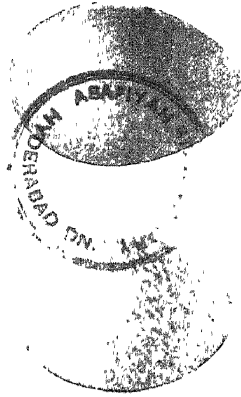
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EGGS OF AMERICAN BIRDS (PLATE II)

as in Buffalo and Louisville in 1837, St. Louis and Providence in 1839, Springfield (Mass.) in 1840, New Orleans in 1841, Rochester in 1843, Columbus in 1847, Syracuse in 1848, Baltimore in 1849, Boston in 1851, New York in 1852, and Chicago in 1854.

Later developments in the provision of education are characterized by a gradually broadening conception of its functions and service. Attendance became more generally compulsory; the curriculum of the elementary schools was extended by the addition of new subjects, such as manual training between 1887 and 1890; the kindergarten was added in St. Louis in 1873; public high schools increased in number after 1880; and the facilities for the training of teachers were improved not only by the establishment of State normal schools and city training schools, but by a quickened interest in education as a subject worthy of academic study. The period was also marked by the foundation of the National Education Association in 1857, and the establishment of the United States Office of Education in 1867, with Barnard as the first Commissioner.

Recent development has been in the direction of stronger professional organization, on the basis of a definite body of educational science; the more scientific study of education in all its phases; and the closer relation and coöperation of education and the psychological, political, and social sciences. In elementary education, the curriculum has been constantly broadening; and better methods of instruction have been developed, with improved schoolhouses and equipment. In secondary education, the chief change has been in the direction of emancipating the high school from the domination of the colleges, thus freeing it to perform services to meet the educational needs of a wider clientèle.

Present System.—There is no system of national education in the United States. The U. S. Office of Education has no authority over the educational affairs of the country, its chief function being to collect and distribute information. Efforts are being made to raise the Office to the status of a Department, under the charge of a Secretary. The Federal Government touches education at one other point—the distribution of funds for land grant colleges and agricultural experiment stations. None the less, the educational system of the United States is national in scope. This is partly due to the fact that as the population spread over the country it took with it the already existing traditions. More

effective, however, are the numerous national associations for the promotion of educational interests, the chief and largest of these being the National Education Association. Professional magazines and the professional teachers' colleges of national and international repute also exert strong influence. To these should be added such standardizing agencies as college entrance requirements, and the influence and publications of private educational corporations like the General Education Board, the Carnegie Foundation, and the Sage Foundation.

The duty has fallen on each State to safeguard the moral and intellectual welfare of its inhabitants, and to promote the interests of democracy through education. State control is usually exercised through a board of education. The types of boards vary: some consist of certain office holders *ex officio*, as in the South; some are elected, as in Michigan, and in New York (elected by legislature); others are appointed, as in New Jersey, Massachusetts, and Maryland; others, again, are heads of State institutions, such as universities, agricultural colleges, and normal schools, as in Indiana, Nevada, and Utah. The chief function of the State board of education is to set up certain standards of educational requirement, such as compulsory attendance and teachers' qualifications; to equalize educational opportunities through the apportionment of State funds, or to encourage local efforts by the same means; and through properly qualified agents to exercise professional supervision, and provide expert advice to local bodies. Other functions assumed by the State are the control and provision of additional forms of education, such as the training of teachers through normal schools, teachers' institutes, and reading circles; the provision of higher education through universities and agricultural colleges; the education of adult native illiterates and foreign-born adults; rural school supervision; negro education; vocational education; and the education of defectives and delinquents in special institutions.

The immediate charge and responsibility for the provision of schools are left by the State to local agencies, such as towns, townships, counties, and cities. The town is the local unit in the New England States; but the county is increasingly becoming the more common form of organization, especially in the South, the Middle West, and on the Pacific Coast. The duties of the county boards are to establish schools, employ and pay

teachers, and decide the school tax rate. The standards are being raised, however, and several successful county systems have been developed, equal in many respects to city systems. The school is only one factor in the up-building of agricultural districts. Extra-school activities, such as corn-growing contests for boys and canning for girls, tend to bind the school and the home. The so-called country life movement, in helping to make the school the social and educational center of the agricultural district, is at the same time promoting a more intelligent interest in the school, thereby stimulating an improvement in local and county school administration.

The most marked progress in education has naturally been in the cities. The movement of population in the past eighty years has been cityward. This has brought about great social and economic changes that have imposed heavy burdens on education, but the cities have been ever ready to meet them. City administration is usually in the hands of a special board of education. Such organizations as that of Buffalo, where school affairs are controlled by a committee of the city council, are exceptional. The tendency is in the direction of small unpaid boards appointed by the mayor without regard to distinctions of sex, party, or religion, or elected at large by the people. The paid boards of Rochester and San Francisco are exceptional. The number of members varies from five to fifteen, as a rule; the New York City board, formerly of forty-six members, has been reduced to seven members. The functions of a city board of education are large and constantly increasing. Its powers include control of finances, management and supervision of buildings, establishment of new schools, encouragement of new school activities, and appointment and dismissal of teachers. The superintendent of schools in the larger systems must be responsible for all the activities, and must mediate between his subordinate officers and the board of education, which in turn stands between him and the public. It is his duty to make himself acquainted with all aspects of education, to initiate new policies, and to lay these before the board.

Educational Provisions.—The immensity of the educational problem in the United States is indicated by the remarkable growth in provisions and organizations. Following is a brief account of the chief provisions to which the better systems are tending. State legislation relating to compulsory attendance at school varies but slightly. Roughly half of

the States have fixed seven years as the age at which attendance must begin, and the remainder at eight. The pre-compulsory school period, especially in cities, is met by an extension of kindergartens. A fairly marked development of recent years has been the growth of the number of pre-school clinics at which, under the direct charge of highly qualified and specially trained teachers and nurses, little children under the age of five are cared for and taught. The elementary schools receive their pupils at the ages of from six to eight and in eight years aim to lay the educational foundations for the future citizen. In the rural schools the classes are necessarily ungraded; but this deficiency may be remedied, as it has been in many States, by the establishment of consolidated schools. The present aim of the elementary schools is not only to lay the foundations in the so-called instrumental subjects, but to develop taste and appreciation, and to open up for those whose schooling may cease with those schools the great storehouses of human knowledge.

The Dalton Laboratory Plan emphasizes individual instruction. Instead of the usual classes and classroom procedure the pupil is given an outline for a twenty-day job which he contracts to do under his own initiative. When he has finished a subject on this job basis he is given another similar contract. The Platoon School Organization has been designed to meet the conditions of the larger cities, and has been used, notably, in Detroit. Its nature is described by its other name—the 'work-play-study' school. Another significant educational experiment, similarly motivated, is the George Junior Republic in New York State.

No branch of education has been more under fire during recent years than the high school. Freed from the trammels of college entrance requirements, it has increasingly attempted to meet the needs of the varied interests of the adolescent, without meeting any of them satisfactorily. The discussion of the high school problem centers largely in an entire reconstruction of the American system. Until comparatively recently this has been based on eight years of elementary and four years of high school work. The reports of 'The Commission on the Reorganization of Education,' published in successive sections since the year 1913, have had a profound influence on the organization of the educational system as a whole. The general effect of these reports, has been to introduce a six-three-

three plan, wherein, by the introduction of the junior high school between the elementary and the high school, the suddenness of the jump from schooling for immature to that suitable for more definitely matured minds and bodies, might be reduced, and the process be made gradual.

Higher Education.—The establishment of institutions of higher learning was among the first tasks undertaken by the early colonists. In 1636 the institution which soon received the name of Harvard College was provided for. This was followed in 1693 by the establishment of William and Mary College, and in 1701 of Yale. The 18th century saw the addition of the institutions now known as Princeton (1741), Columbia (1754), the University of Pennsylvania (1755), Brown (1764), Rutgers (1766), and Dartmouth (1770). All of these colleges were closely affiliated with the respective denominations of their founders, and their chief service was considered to be the training for the ministry. The close of the 18th century saw the foundation of a number of colleges, including Williams (1793), Bowdoin (1794), Union (1795), and Middlebury (1800), followed by Hamilton (1812), Colby (1815), Amherst (1821), Western Reserve, and Oberlin (1833).

The establishment of State universities was stimulated by the grant of lands made by the Federal Government in 1787. In 1795 a university was opened in North Carolina, which came under complete State control in 1821; the State University of South Carolina was founded in 1801; and the foundations of the State university were laid in Michigan in 1817, and in Indiana in 1820. Under the influence of Thomas Jefferson, Virginia established a liberally conceived State university in 1819. The number of State institutions increased with the development of new territory throughout the century.

Higher education for women began in the 19th century, its foundations being laid in the academies. The earliest institution of college grade for women was Mount Holyoke, founded in 1837 by Mary Lyons; followed in 1855 by Elmira College, in 1865 by Vassar, in 1870 by Wellesley, in 1871 by Smith, and in 1885 by Bryn Mawr. During this period, however, a number of colleges for men admitted women also, the first being Oberlin College in 1833, followed twenty years later by Antioch College. Once admitted to the benefits of college education, the privilege of graduate study was soon granted to women.

The early college curriculum was modelled on that of the English universities, and was confined to the classics, Hebrew, religion, logic, and philosophy. Under the influence of Benjamin Franklin began the movement for the introduction of the sciences; while Jefferson's influence at the College of William and Mary led to the addition of natural history, natural philosophy, and modern languages. French and natural history were first offered at Harvard about 1790. Before the middle of the 19th century most of the work was prescribed, and was mainly classical in emphasis. Under the influence of President Wayland of Brown, President Barnard of Columbia, and President Eliot of Harvard, the elective system was introduced, and with it a further expansion of the curriculum.

The industrial and technical progress of the country imposed new obligations on the colleges, which were met after 1862 by the foundation of agricultural and mechanical arts colleges. A similar influence was exercised by the growing interest in the political and social sciences. The first graduate department was added at Yale in 1847, and the first P. H. D. degrees were granted there in 1861. Graduate instruction was announced at Princeton in 1877, at Harvard in 1880, at Columbia in 1881; while Cornell and Johns Hopkins offered graduate work from their foundation. For professional studies, see LEGAL EDUCATION; MEDICAL EDUCATION; TECHNICAL EDUCATION.

The colleges and universities while retaining the cultural subjects, are constantly adding new ones to meet the increasing demands of modern complex conditions. See UNIVERSITY EXTENSION. There are in all more than a thousand public and privately owned universities, colleges, and professional schools in the United States. College enrollment has grown nearly six times as fast as the general population.

Consult R. G. Boone's *Education in the United States*; E. E. Brown's *The Making of Our Middle Schools*; N. M. Butler's *Education in the United States*; Kandel's *Twenty-five Years of American Education* (1924); E. W. Knight's *Education in the United States* (1929); C. H. Judd's *Unique Character of American Secondary Education* (1928) and *Problems of Education in the United States* (1933); *Annual Reports* of the U. S. Commissioner of Education, and *Bulletins* of the U. S. Office of Education.

There has been a growing tendency in the United States to make all teachers, whether

in public schools or privately endowed institutions, take special oaths of allegiance. In 1937 there were teachers' oath laws in twenty-two states and in the District of Columbia. Many educators strongly opposed these laws, considering them a danger to academic freedom.

A movement which met with considerable success in some of the larger cities in the country in 1937 was a concerted attempt to organize adult education. This movement was furthered during 1938-41 by the W.P.A.

When the U. S. entered World War II, the educational scene changed overnight. In World War I, only 21% of the men in the U. S. army had attended school beyond the eighth grade. Of the army mobilized in 1942, 69% were high-school graduates or had attended high schools. However, it was found that the typical education provided by high schools had been nontechnological, and also that educational shortages of the men in regard to American as well as world social organization were enormous. The army therefore undertook an extensive educational program, making arrangements with a number of universities to use part or all of their campus facilities for the conduct of officers' schools. As a result, high-school courses became more functional in order to meet the demands not only of a world at war but also of an air-minded post-war world. See pamphlets issued by the U. S. Office of Education and the Nat. Ass. of Secondary School Principals.

Education, U. S. Office of, a division of the Department of the Interior whose function is to collect statistics and facts and to diffuse such information as shall aid the people of the United States in the establishment and maintenance of efficient school systems. Its head is the Commissioner of Education. It publishes *Education for Victory*.

Edward the Confessor (d. 1066), king of England, was born at Islip, Oxfordshire. He was a rather spiritless king, who for his monk-like virtues was canonized by Pope Alexander III. in 1161. He caused Westminster Abbey to be built.

Edward I. (1239-1307), king of England, was born in Westminster. In 1270 he joined the last of the Crusades, undertaken by Louis IX. of France. The early part of Edward's reign was devoted to legal and administrative reforms. In 1290 the Jews were expelled from England for extortionate usury.

He forced the Welsh leaders to terms of peace (1277); crushed a fresh outbreak (1282-3); and issued the statute incorporat-

ing Wales with England (1284). During the second half of his reign, from 1290 to 1307, Edward was largely engaged in Scottish affairs. The King then turned his attention to France; but the clergy, headed by Archbishop Winchelsea, refused fresh subsidies, and were supported by the bull *Clericis Laicos* of Pope Boniface VIII. The King retaliated by placing the clergy of the kingdom in outlawry. At the Salisbury parliament (1297) the great barons also refused to take part in foreign war, while the hostility of the merchants was aroused because their wool had been seized. A compromise was effected with the clergy, and a temporary illegal grant was procured from the nobles and commons. Edward then sailed for Flanders, and while at Ghent confirmed Magna Charta with such supplementary clauses as were demanded by his refractory nobles, thus finally establishing the right of the people themselves to determine taxation.

Edward was recalled to Scotland by a fresh uprising led by William Wallace and there won the Battle of Falkirk in 1298. Having made peace with Philip of France (1299), he again invaded Scotland (1301). Wallace was captured and executed in 1305; but the next year Robert Bruce headed a revolt; and Edward died at Burgh-on-Sands, near Carlisle, while leading an army against him.

Edward II. (1284-1327), king of England, was born at Carnarvon Castle in Wales, the son of Edward I. and Eleanor of Castile. In 1311 the barons drew up the Ordinances for the administration of the country by a governing body of barons.

1322, with the aid of his new favorites, Hugh le Despenser the Elder and Younger, Edward attacked and defeated the barons at Boroughbridge (1322). The Parliament of York revoked the Ordinances, and re-established the authority of the king, lords, and commons. Queen Isabella made common cause with the exiled nobles against her husband and the Despensers, she embarked from Dort, with a body of malcontents, and landed on the coast of Suffolk (Sept. 24, 1326). Edward fled, but was taken prisoner in Glamorganshire. He was compelled to resign the crown in 1327, and was murdered in Berkeley Castle.

Edward III. (1312-77), king of England, was born in Windsor, the son of Edward II. and Isabella of France. The scene of Edward's principal exploits was France. He claimed the crown of that kingdom through his mother Isabella, and in 1337 declared war against

Philip VI. Edward was at first singularly unsuccessful, and he soon found himself at issue with his nobles. At length, in 1346, accompanied by his eldest son, Edward the Black Prince, he conquered a great part of Normandy, marched to the gates of Paris, and on Aug. 26 inflicted a crushing defeat on the French at Crécy. After the fall of Calais (1347) a truce was concluded.

In 1349 the terrible Black Death carried off a third of the total population of England.

Edward IV. (1442-83), king of England, son of Richard, duke of York, and Cicely Nevill, daughter of the first earl of Westmoreland, was born in Rouen, France. After his father's death at Wakefield (1460), he became the head of the Yorkist party and in the Battle of Towton (March 29, 1461) completely overthrew the Lancastrians. See *ROSES, WARS OF THE*. His reign was a constitutional disappointment, for he lessened the importance of Parliament, and deprived men of their right to trial by jury. Consult J. R. Green's *History of the English People*.

Edward V. (1470-83), king of England, son of Edward IV., was born at Westminster, and succeeded to the throne at the age of thirteen. The story of his life is brief and tragic, his father's brother Richard, duke of Gloucester, obtained possession of his person (May 1483). Richard was appointed protector of the kingdom. In June the young Duke of York, Edward V's brother, also fell into his hands. The two hapless boys were then removed to the Tower, and were never more heard of.

Edward VI. (1537-53), king of England, the son of Henry VIII. by Jane Seymour, was born at Hampton Court. Being only nine years old at his accession, a council of regency was formed under his uncle, the Earl of Hertford, later duke of Somerset. The Bloody Statute of Henry VIII. was repealed; and a new prayer book, known as the First Prayer Book of Edward VI., was issued in 1549. In 1552 the Second Prayer Book, of a more reformed type than the First, was issued, as well as the forty-two articles embodying the doctrines of the Church of England. Edward died of consumption in his sixteenth year.

Edward VII. (1841-1910), king of Great Britain and Ireland, the eldest son of Queen Victoria and Prince Albert, was born at Buckingham Palace, London. Queen Victoria died on Jan. 22, 1901, and Edward VII. was proclaimed with all the usual ceremonies, and the coronation, after postponement, took place

on August 9, 1902 in Westminster Abbey.

In 1903 the King began a series of noteworthy diplomatic journeys, that extended over the eight years of his reign, and his diplomacy earned for King Edward the popular title of 'Edward the Peacemaker.' On May 6, 1910, after an illness of scarcely three days' duration, King Edward died at Buckingham Palace. The body lay in state until May 20, when the funeral took place. Among the distinguished mourners, besides the English royal family, were the rulers of Germany, Greece, Norway, Spain, Denmark, Bulgaria, Portugal, and Belgium; former President Roosevelt, as Special Ambassador of the United States, and delegations from all the British colonies. Consult Lee's *King Edward VII.* (1925-27).

Edward VIII. (1894-), king of Great Britain and Ireland and of the British Dominions beyond the Seas, and Emperor of India, eldest son of George V. and Queen Mary of England, was born in White Lodge, Sheen. As Prince of Wales, he visited all parts of the British Empire, the United States, Japan, and South America. At the death of King George V., on January 20, 1936, he succeeded to the throne and reigned uncrowned until December 11, 1936, when he abdicated in favor of his younger brother, the Duke of York. (See *GEORGE VI.*) As the Duke of Windsor the former king, with his bride (See *EDWARD VIII., ABDICATION OF*), remained in Europe until Sept., 1939, when he returned to Eng., was commissioned a major gen. and went to Fr. with the army. He was governor of the Bahama Islands (1940-45).

Edward VIII, Abdication of, took place on December 11, 1936, after a reign of 327 days. He was succeeded by his brother, the Duke of York, who assumed the title of George VI. The reason for Edward's abdication, as acknowledged publicly by him, was the opposition of the Baldwin Ministry to a so-called morganatic marriage with an American-born woman, Mrs. Wallis Warfield Simpson. Mrs. Simpson, on October 27, 1936, had been granted a divorce (carrying a decree nisi to become absolute on April 27, 1937) from Ernest Aldridge Simpson. On December 10, Edward's abdication letter was read by Prime Minister Baldwin to the House of Commons. In it Edward named his brother, the Duke of York, as his successor to the throne. The Abdication Act was passed on December 11, 1936, and that same night the former king broadcast to the world by radio his farewell address:

"At long last I am able to say a few words

of my own. I have never wanted to withhold anything, but until now it has not been constitutionally possible for me to speak.

"A few hours ago I discharged my last duty as King and Emperor, and now that I have been succeeded by my brother, the Duke of York, my first words must be to declare my allegiance to him. This I do with all my heart.

"You all know the reasons which have impelled me to renounce the throne. But I want you to understand that in making up my mind I did not forget the country or the empire, which, as Prince of Wales and lately as King, I have for twenty-five years tried to serve.

"But you must believe me when I tell you that I have found it impossible to carry the heavy burden of responsibility and to discharge my duties as King as I would wish to do without the help and support of the woman I love.

"And I want you to know that the decision I have made has been mine and mine alone. This was a thing I had to judge entirely for myself. The other person most nearly concerned has tried up to the last to persuade me to take a different course.

"I have made this, the most serious decision of my life, only upon the single thought of what would, in the end, be best for all.

"This decision has been made less difficult to me by the sure knowledge that my brother, with his long training in the public affairs of this country and with his fine qualities, will be able to take my place forthwith without interruption or injury to the life and progress of the empire. And he has one matchless blessing, enjoyed by so many of you, and not bestowed on me—a happy home with his wife and children.

"During these hard days I have been comforted by her majesty my mother and by my family. The ministers of the crown, and in particular, Mr. Baldwin, the Prime Minister, have always treated me with full consideration. There has never been any constitutional difference between me and them, and between me and Parliament. Bred in the constitutional tradition by my father, I should never have allowed any such issue to arise.

"Ever since I was Prince of Wales, and later on when I occupied the throne, I have been treated with the greatest kindness by all classes of the people wherever I have lived or journeyed throughout the empire. For that I am very grateful.

"I now quit altogether public affairs and

I lay down my burden. It may be some time before I return to my native land, but I shall always follow the fortunes of the British race and empire with profound interest, and if at any time in the future I can be found of service to His Majesty in a private station, I shall not fail.

"And now, we all have a new King. I wish him and you, his people, happiness and prosperity with all my heart. God bless you all! God save the King!"

After this address the former king left England as a private citizen. The following day, George VI. gave his brother the title of Duke of Windsor. On June 3, 1937 the Duke of Windsor and Mrs. Simpson were married.

Edwards, Bela Bates (1802-52), American educator and editor, was born in Southamptn, Mass. His principal work was the editing of the *American Quarterly Register* from 1828 to 1842.

Edwards, Bryan (1743-1800), West India merchant, was born in Westburg, Wiltshire, England. He became a prominent opponent of the abolition of slavery.

Edwards, George Wharton (1869-), American artist and author, was born in Fair Haven, Conn. He gained reputation for his water color work, but more especially as an illustrator and mural painter. His literary works include *Thumbnaill Sketches* (1886); *Some Old Flemish Towns* (1911); *Vanished Towers and Chimes of Flanders* (1916); *Belgium Old and New* (1920).

Edwards, Harry Stillwell (1855-1938), American writer, was born in Macon, Ga. He was the originator of the Stone Mountain Memorial Coin. He won the prize of \$10,000 offered by the Chicago Record with his story, *Sons and Fathers*. Among his other works are *The Marbeau Cousins* (1889); *Two Runaways*, and *Other Stories*.

Edwards, Henri Milne. See **Milne-Edwards**.

Edwards, Jonathan (1703-58), American clergyman and metaphysician, was born in East Windsor, Conn. His writings brought him into correspondence with eminent divines abroad, especially in Scotland, where his services were held in high esteem. The correspondence is given at length by Hickman in his *Life of Edwards*. His treatise on *The Freedom of the Will* (1754), a masterly exposition of the determinist's side of the controversy, is among the most celebrated of American theological works. He is a follower of Locke, but imbues the treatise with the originality of his personality, and carries out the theme with an

exhaustiveness that had never before been attempted. His logic, whether written or spoken, was wonderfully convincing. A famous instance of his power as a preacher was the scene at Enfield where, in describing the after life of the damned, he was obliged to interrupt his discourse to quiet the congregation which he had wrought up to frenzied emotional pitch. He gave a strong impetus to philosophical and religious thought and was the founder of the Calvinistic school known as the Edwardean or New England Theology. He wrote on widely diverse subjects, including *Thoughts on the Revival of Religion in New England* (1742), *Qualifications for Full Communion in the Visible Church* (1749).

Edwards, Jonathan 2d (1745-1801), American theologian, son of Jonathan Edwards, was born in Northampton, Mass. He was the founder of the 'governmental' theory, allowing salvation to repentant sinners through the love of God, which was long the accepted theory among New School Presbyterians and Congregationalists. His chief works are *A Dissertation Concerning Liberty and Necessity* (1797), and three sermons on *The Necessity of the Atonement* (1785).

Edwards, Pierrepont (1750-1826), American lawyer and public official, was born in Northampton, Mass., youngest son of Jonathan Edwards. He was a member of the Confederation Congress 1787-88, and at the time of his death judge of the U. S. district court. He aroused much feeling among the Calvinists of Connecticut by founding a Toleration party.

Edwin, or Eadwine (?585-633), king of Northumbria. He is the reputed founder of Edinburgh.

Eel, a fish belonging to a group of soft-rayed fishes (*Apodes*) distributed in almost all fresh waters and seas of the temperate and tropical zones. The most familiar forms are the conger (*Conger vulgaris*) and the common eel (*Anguilla anguilla*). Eels are much esteemed as a food in Europe and North America, but there is a prejudice against them in some countries. They are caught mainly in baited traps.

Eel-grass (*Vallisneria spiralis*), an aquatic plant found in fresh waters in most parts of the world.

Eel-pout, a name for the burbot.

Eells, Myron (1843-1907), American clergyman and ethnologist, was born in Walker's Prairie, Wash. He was in charge of the Washington anthropological exhibit at the Columbian Exposition, and wrote many papers on

the Indians of the Northwest, besides preparing vocabularies of their dialects.

Effendi, a Turkish title of honor, generally applied to officials, civil servants, and men of learning, although sometimes given from courtesy to persons not occupying any public position.

Effervescence, the escape of gas bubbles from a liquid, caused either by a reduction of pressure or by the formation of gas by some chemical action.

Efficiency, an economic term which in recent years has been employed to indicate an attempt to produce the best possible results with the least expenditure of effort, and the reduction of waste to a minimum.

Efficiency, in machines, is the ratio of the useful work done to the energy supplied.

Effingham, city, Illinois. It is the seat of the Bissel College of Photography; p. 6, 180.

Efflorescence, the crumbling to powder of crystals caused by the loss of water previously present in them. It happens whenever the vapor pressure of the water in the crystal is greater than that of the moisture in the surrounding atmosphere. A good example is washing soda, $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$.

Effusion of Gases, a term applied to the escape of gases under pressure through fine holes in thin plates. It takes place at a rate that is proportional to the square root of the difference of pressure and inversely proportional to the square root of the density of the gases, and differs from diffusion of gases in that the composition of a mixture of gases is not, as a rule, altered in the process. Effusion of gases is applied to compare the densities of gases by noting their rate of escape. See GASES.

Egan, Maurice Francis (1852-1924), American author, was born in Philadelphia. In 1907 he became United States minister to Denmark. His published works include two volumes of verse, *Preludes* (1880), and *Songs and Sonnets* (1886), *That Girl of Mine* (1879), *Lectures on English Literature* (1889), *Studies in Literature* (1900), *Ten Years on the German Frontier* (1919).

Egan, Patrick (1841-1919), Irish-American public official, was born in County Longford, Ireland. His influence exerted in the presidential campaigns of 1884 and 1888 was instrumental in securing his appointment by Harrison as minister plenipotentiary to Chile. In 1896 and 1900 he was active in the cause of the free silver party. The successful issue of the Parnell suit against the London *Times* in 1889 was largely due to Egan's testimony.

Egan, Pierce (1772-1849), English author, was born in London. His first work, issued in 1814, entitled *The Mistress of Royalty, or the Loves of Florizel and Perdita*, satirizes the prince regent's irregularities. This gave the author a wide reputation among a certain class of readers.

Egan, Pierce (1814-80), English novelist and artist. He published a long series of historical novels, edited the *Home Circle* (1849-51), and was one of the leading writers in the *London Journal*. He also contributed to journals in the United States.

Egbert (d. 839), king of Wessex from 802, the son of Ealhmund, a king of Kent, lived some thirteen years at Charles the Great's court. He at first warred successfully against the Welsh of Devon and Cornwall, and then turned against the Mercians, and in 825 overthrew their king, Beornwulf, in the battle of Ellandune. Egbert spent the remaining years of his life in attacking the Northmen. Consult Green's *The Conquest of England*.

Egede, Hans (1686-1758), called the 'Apostle of Greenland,' was born in Senjen, Norway. He went out as a missionary to Greenland, and remained there seventeen years, enduring great hardships but converting many of the Eskimos to Christianity. From 1740 to 1747 he was superintendent, or bishop, of the Greenland mission.

Egede, Paul (1708-89), Danish-Norwegian missionary, son of Hans Egede, was born in Vaagen, Norway. He succeeded his father as superintendent of the Greenland mission. He completed (1776) the translation into Eskimo of the New Testament begun by his father.

Eger, or Cheb, town, Czechoslovakia. The town hall, in which Wallenstein was assassinated (Feb. 25, 1634), is partly converted into a museum. The old imperial citadel, built by Frederick I. in 1157-59, is now in ruins. The chief industries are brewing, and the manufacture of textiles, shoes, machinery, and furniture; p. 27,524.

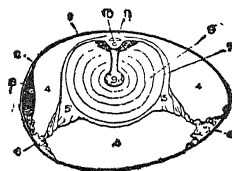
Egerdir, lake, Asia Minor, between Sultan Dag and the Taurus mountains. It is extremely picturesque.

Egeria, in Roman legend, one of the Latin muses, who was said to have inspired the second king of Rome, Numa Pompilius, in his religious innovations. From her the name Egeria has become proverbial for that of a female adviser.

Egg, Isle of. See **Hebrides**.

Egg, a cell of protoplasm with a nucleus containing the potentiality of life. The most

common use of the word refers to the product of the barnyard fowl. The egg of the common fowl when laid consists of the following parts: (1) The central yolk; (2) the investing layer of albumin—white of egg—which has running through it two cords called the chalazæ; (3) a double membrane lining the shell; (4) the shell itself. In an egg which has not been incubated, a small circular patch of white color, commonly known as the cicatrix or tread



Diagrammatic Section of Egg

1, Shell; 2, shell membrane, external layer; 3, air space; 4, albumin; 5, chalazæ; 6, attachment of chalazæ; 7, yolk bag; 8, yellow yolk; 9, white yolk; 10, blastoderm; 11, cicatrix.

may be seen on the surface of the yolk. This is the blastoderm or 'germ-skin,' and consists of a plate of cells which have arisen by the division of a nucleated mass of protoplasm which originally lay at the periphery of the yolk. It is from this patch of cells only that the chick originates; the other parts of the egg are merely accessory structures, destined to feed or protect the developing chick.

If the ovary or egg-organ of the laying hen is examined, it will be found that its surface is studded with yellow bodies of varying sizes, each representing the yolk of a future egg. Each of these yellow bodies is an egg or ovum in the biologist's sense, each consisting of a single cell enormously distended with yolk. These ovarian eggs are fertilized soon after leaving the ovary, and as they pass down the oviduct become invested by the albumin. As they rotate in their downward passage, part of this albumin becomes twisted into knotted ends, the future chalazæ. Two membranes which surround the albumin are at one point widely separated, the intervening space being filled with air, and serving for the respiration of the future chick. The shell is porous, and though pure white or brownish in the common fowl, is in the majority of birds colored or marked in some way. This description will make it clear that those structures—such as white, membrane, and shell—which enter so largely into the popular conception of an egg are, biologically, simply adaptations to the conditions under which the development of the young bird takes place.

An egg shed into water has little chance of drying up; owing to the relatively great density of water, especially sea-water, it has not much to fear from environmental shocks; to many aquatic larvæ, at least, food is obtainable with considerable ease; but an egg laid in the rare medium air is exposed to severe mechanical shocks, possibly also to drought, and food is not so easily procured as in the sea. We thus find that the eggs of birds and reptiles, the two groups of large animals which lay them on land, are of complicated form, with a large amount of food material; while the eggs of most animals which lay them in water are of relatively simple form, each consisting of a single cell, containing more or less yolk, sometimes naked, sometimes with a simple albuminous investment.

Of all eggs, those of birds, with their firm outer shell, have always attracted most interest—an interest often fully justified, by the beauty of form and marking. In many cases there is some correspondence between the color of the egg and the place in which it is laid, this being especially true in the case of those birds which build slight, open nests, in reality not true nests.

From earliest times eggs have been a highly important form of nourishment in all countries and among all peoples. Hens' eggs are most common, although the eggs of ducks, geese, turkeys, and guinea fowls are eaten to a greater or less extent. Other eggs besides those of birds are sometimes eaten. Turtle eggs are highly prized in most countries where they are abundant and fish eggs, especially those of the sturgeon, are used in large quantities preserved with salt, under the name of caviar. Shad roe is also a familiar example of fish eggs used as food. Eggs of different kinds of domestic poultry vary in size and appearance, and there is also a considerable range in the size of eggs of different breeds. On an average a hen's egg is 2.27 inches in length, and 1.72 inches in diameter or width at the broadest point, and weighs about 2 ounces, or 8 eggs to the pound (1.5 pounds per dozen). Large quantities of egg white are used in the manufacture of albumen paper for photographic purposes, and the egg white and yolk, and products made from them, are important in the manufacture of many different articles.

Eggs which are perfectly fresh have the finest flavor. On a commercial scale, eggs are held in cold storage chambers at a temperature of about 32°F. They are commonly preserved in the home by immersion in water-glass solution, in lime water, or similar ma-

terials that prevent the access of the air which carries microorganisms causing decay. There are various egg preparations and substitutes on the market, chief among which are dessicated or dried eggs and egg powders. Consult Smith's *World's Food Resources* (1919); Bailey's *Food Products: Their Source, Chemistry and Use* (1927); U. S. Department of Agriculture *Farmer's Bulletin* 128. See also CELL; EMBRYOLOGY; OOLOGY; POULTRY and POULTRY FARMING.

Egg, Augustus Leopold (1816-63), English genre painter, was born in London. He studied at the Royal Academy, and his first important work, *The Victim*, was exhibited in Liverpool. He became a Royal Academician in 1860. His pictures are chiefly historical, or of a literary nature. Among them may be mentioned *The Night before Naseby* (1859); *A Scene from Le Diable Boiteux* (1844); in the National Gallery; *Pepys' Introduction to Nell Gwinne* (1851); *Peter the Great Sees Catherine for the First Time* (1850); *Katherine and Petruchio* (1860).

Egga, trading station, Nigeria, West Africa, important commercially, having a trade in ivory; p. 15,000.

Egg-eating Snake, a small, harmless, tree-climbing snake of South Africa (*Dasy-peltis scabra*), remarkable for subsisting almost entirely on birds' eggs. The teeth in the mouth are few and small, but the inferior spines of the vertebrae project into the gullet and, being tipped with enamel, function as throat-teeth. They are used to break through the shells of the eggs on which the animal feeds.

Egger Moths, or **Eggar Moths**, a name given to the members of the family Lasio-campidæ, some of which are also called lap-pet moths. The members of this family are densely covered with scales, and in the male the antennæ are beautifully pectinated. The eggs are smooth, sometimes spotted like those of birds, and occasionally covered with hair from the body of the parent.

Eggleston, Edward (1837-1902), American author, Methodist circuit rider, editor of the Chicago *Sunday-School Teacher*, literary editor of the New York *Independent* and editor of *Hearth and Home*, founder of a creedless church—the 'Church of Christian Endeavor' at Brooklyn, N. Y. Among his writings are *The Hoosier Schoolmaster* (1871), which was his most famous book; *The Circuit Rider* (1874); *The Graysons* (1888); *The Beginners of a Nation* (1896); and (posthumously) *A New Century History of Life*

in the United States (1904). Consult *The First of the Hoosiers* by G. C. Eggleston.

Eggleston, George Cary (1839-1911), American journalist and author, brother of Edward Eggleston, was managing editor and editor of *Hearth and Home*, literary editor of the New York *Evening Post*, editor of the *Commercial Advertiser*, and editorial writer for the New York *World*. He wrote many books including *The Big Brother* (1875), *Red Eagle* (1878), and *The Last of the Flat Boats* (1900), *A Carolina Cavalier* (1901), *The Warrens of Virginia* (1908), *History of the Confederate War* (2 vols., 1910).

Eggplant, a kitchen vegetable closely related botanically to the potato and tomato. It is a native of the tropics and is cultivated in all warm countries for its fleshy egg- or pear-shaped fruits, which attain sizes from a few ounces to three or four pounds. Most varieties have a deep purple exterior, though there are white varieties and some of other shades. In the United States eggplants are extensively grown in the South.

Egilsson, Sveinbjörn (1791-1852), Icelandic scholar. With others he prepared and published (1825-37) a *History of the Icelanders*. His greatest work was a dictionary of old Norse poetry, *Lexicon Poeticum Antiquæ Lingvæ Septentrionalis*.

Eglantine, a poetic name for the sweet brier often grown in gardens. Many beautiful hybrids have been produced, having the fragrant foliage of the eglantine, and also bearing flowers of many colors derived from the other parents.

Eglinton and Winton, Archibald William Montgomerie, Earl of (1812-61), English politician, is chiefly known as the organizer of the celebrated Eglinton Tournament (1839), to which he invited all the leading nobility. Lady Seymour was queen of beauty, and among the knights was Louis Napoleon, afterwards Napoleon III.

Egmont, Lamoral, Count of (1522-68), Flemish soldier and patriot. The despotic incident of his being treacherously seized and beheaded was the prelude to the revolt of the Netherlands.

Ego, the term used in Philosophy to signify the self-conscious subject, or individual person abstractly considered, apart from the world and other persons.

Egoism, the term used in ethics to signify the principle of private happiness, the principle that for the individual his own good can never be merely subservient to any other good, but must have an ultimate value in

itself, or even be for him the final consideration. This principle must not be confounded with vulgar selfishness. The term is very often used, however, in contrast with 'altruism.'

Egret, a name given to certain small white herons, as the Little Egret of Southern Europe, and the American Egret and Snowy Heron, both birds of southerly latitudes, now greatly reduced in numbers by the destruction wrought by plume hunters.

Egypt, since 1922 an independent state, in the northeastern part of Africa, stretching from the Mediterranean on the n. to the Egyptian Sudan on the s., and from the Red Sea on the e. to Tripoli and the Sahara on the w. The total area, which includes the Libyan desert, the desert region between the Nile and the Red Sea, and the Sinai Peninsula, is about 350,000 square miles, but the cultivated and settled area—the Nile valley and delta—is only 12,226 square miles. Egypt is connected with Asia by the Isthmus of Suez, crossed by the famous Suez Canal.

Egypt lies in the desert zone, its distinguishing feature being the fertile valley and delta of the Nile. West of the Nile lies the waste of the Libyan Desert, dotted here and there by fertile oases. East of the river a mountainous district extends along the shores of the Red Sea, rising in places to heights of 5,000 to 7,000 ft.; s. of this lies the desolate hills and sand plains of the Nubian Desert. The Nile has a total course in Egypt of 800 miles, and is navigable throughout that distance. Once a year it overflows its banks and deposits upon the land a rich layer of alluvial sediment, turning the otherwise barren rock into cultivable soil. A most remarkable phenomenon is the regular increase of the Nile, fed by the fall of the tropical rains in the Abyssinian highlands. In the middle of July the red water appears, and the rise may be dated from that time; it attains its maximum (an average rise of 36 ft. at Thebes, of 25 at Cairo) at the end of September, and begins to decline visibly in the middle of October, loses half its height by January, and subsides to its minimum in April. The delta extends from the Mediterranean to Cairo, about 100 miles, and is covered with a network of canals which make perennial irrigation possible and render this region—known as Lower Egypt—exceedingly productive. The remainder of the Nile Valley, varying in width from one to fifteen miles, constituting Upper Egypt, depends for fertility upon the submersion at high Nile—supplemented by the storage waters of the great Assuan reser-

voir above the First Cataract. One of the most interesting physical characteristics of Egypt is the general absence of rain throughout the greater part of the country. The *climate* is remarkably mild, especially s. of the Delta and in the desert; snow falls occasionally on the highest mountains.

The coast has sunk since about one thousand years ago and let the sea in to large districts of alluvium which were most fertile provinces in Roman times. The effect of wind and sand-storms is considerable. The signal peculiarity of the vegetation of the Nile Valley is the absence of woods and forests. The date and the doom palm, the sycamore, acacia, tamarisk, and willow are the commonest trees. The vine, fig, pomegranate, orange, and lemon abound, and watermelons are at once the meat and drink of the people in the hot days. Of flowers, the celebrated lotus, or water-lily, has supplied many ideas to Egyptian architects. There are few wild animals. The crocodile and hippopotamus live on the banks of the Nile; many varieties of reptiles and water fowl are found, and camels and ostriches abound in the deserts.

Minerals.—In ancient times Egyptian quarries supplied the materials for its great buildings, statues, and obelisks; granite, syenite, basalt (from Assuan), breccia diorite, verde antique, and fine red porphyry (from the mountains in the Arabian desert), sandstone and limestone (from the hills bordering the Nile), and alabaster (from Tellel-Amarna). At the present time, however, the quarries are worked only intermittently, and the mineral products of the country are of small value.

Agriculture is the chief industry, about 62 per cent. of the population being engaged in cultivating the land. The cultivable area is reckoned at 8,520,000 acres, of which more than a quarter was unreclaimed. In Lower Egypt and Fayum, with perennial irrigation, the chief crops are cotton of excellent quality, rice, wheat, barley, and clover; in Upper Egypt, where the basin system is in use, the principal crops are cereals and vegetables. The agricultural year includes three seasons of crops: the winter crops, sown in November and maturing in May or June, include cereals of all kinds; the summer crops, planted in March and harvested in October, consist mainly of cotton, sugar, and rice; the autumn crops, July to September or October, of rice, maize, and vegetables.

A large proportion of the trade is with Great Britain and the British colonies. Raw cotton is by far the most important article

of export, followed by cereals, vegetables, and cigarettes. The principal imports are manufactured products. Manufacturing in Egypt is increasing however, a high protective tariff having been in effect since 1930. Transportation in the Nile Valley and Delta is by means of rail and river, and caravan routes furnish communication with the oases in the Libyan Desert, and with the Red Sea. Telegraph and telephone lines are controlled by the government. The principal ports are Alexandria through which the bulk of foreign trade passes, and Port Said at the terminus of the Suez Canal.

The population of Egypt is about 14,210,360, mostly segregated in the farming region. Of the total, about 91.5 per cent. are Moslems and about 8 per cent. Christians. Cairo, capital and largest city, has a population of 1,064,467. Other large towns are Alexandria, 573,063; Port Said, 100,899; and Tanta, 90,016.

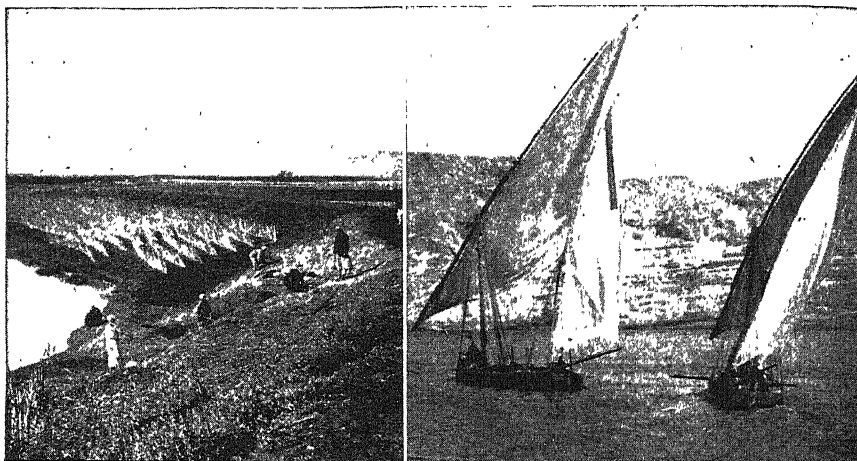
Elementary education is largely conducted by the 'maktabs,' or vernacular schools, aided by governmental grants. There are, also, a few 'infant schools' and higher elementary and primary schools; secondary, special, and technical schools; teacher training schools, and higher colleges under government control. The Mosque of El Azhar, at Cairo, founded in 972, is the chief seat of Koranic learning; it has nearly 10,000 students.

Prehistoric Egypt.—The oldest remains of man in Egypt are probably the large palæolithic flints which lie on the bare surface of the desert plateau above the Nile. The beginning of the continuous civilization of Egypt dates from about 8000 or 7000 B.C. There is no break of continuity of human works from that age, through every generation, to the present, though the continuous written record does not begin till about 5000 B.C. At this date Egypt was already in a state of high civilization. Large ships were built, which were rowed by as many as fifty or sixty oars—therefore probably used on the Mediterranean, and indicating an active commerce, of which the traces remain in the pottery from foreign lands found in the graves. A large body of script signs were used, and were probably spread over the Mediterranean.

Dynastic History.—At probably 5000 B.C., or earlier, an invading and conquering race forced its way into the Nile valley. This people brought in a great artistic ability, and the use of pictorial signs which we call hieroglyphs. This system was aided by a strong caste for symbolism, and a love of expressing

the plainest facts by symbolic figures. These records have come down to us on portions of carved slates, with scenes in high relief. From these we see that there were five races of different types included in the conquests of the incoming people, who united the land and founded the dynastic history. Our knowledge of the kings before the first dynasty, and of that and the second dynasty, is derived entirely from discoveries of objects in the royal tombs from the deposit of Hierakonpolis, and from historic lists on a few monuments of later age, and those preserved

zation which then existed. After the decay of this civilization, which lasted until about 3335 B.C., many centuries of rude imitation followed. There was a revival of splendid works in the twelfth dynasty (2778-2565 B.C.). The thirteenth and fourteenth dynasties were an age of decay. The seventeenth dynasty reveals a gradually increasing power that led to the most showy and best-known age of ancient civilization, that of the eighteenth dynasty, 1587-1328 B.C. Tutankhamen was one of the kings in this dynasty, which extended the power of Egypt to its farthest



Photos from Paul M. Hinkhouse.

Along the River Nile.

Cultivation is carried to the waters edge, row on row of vegetables and grain being added as the overflow gradually recedes. The river freighters in the picture to the right are known as 'Markubs.'

to us from the history written in Greek by Manetho about 270 B.C. These later authorities show hardly any discordances from the contemporary monuments of the tombs. Mena appears to have first united the whole of Egypt in one kingdom, and is always recorded as the first king of the first dynasty, 4777-4514 B.C. The period of the second dynasty is 4514-4212 B.C., and of the third, 4212-3998 B.C. The age of grandest construction begins with the fourth dynasty, the pyramid builders, 3998-3721 B.C.

The pyramid of each king was begun early in his reign on one definite plan, and in only one or two cases was it enlarged. The private tombs of this age are grander and more full of sculpture and detail than in any later time, and they supply a full view of the high civili-

limits. The native Egyptian civilization was greatly altered by the influx of Syrians and their products, and a strong influence of the Mycenæan art of Greece is also seen. The great number of richly decorated private tombs shows the wealth of the time and the growth of an army of officials. The arts flourished, not only in stonecarving and other inherited crafts, but also in new directions, particularly glass-working and the use of glazes for decoration. Literature also became more elaborate, and a great quantity of papyri has been preserved from this age. The nineteenth dynasty was military in spirit and an age of continual degradation.

There followed a period of general dissolution with the Ethiopians in control at the close of the twenty-fifth dynasty, 665 B.C.

After this general dissolution, the Libyan family of one of these Ethiopian chiefs came into power and founded the twenty-sixth dynasty. This age is best known from the Greek historians. The twenty-sixth dynasty, like others, began with strong rulers, but succumbed to the Persians, who held the land for one hundred and twenty years. Alexander the Great delivered Egypt, but absorbed its life permanently into Western channels. After his brief rule it passed to the hands of his ablest general, Ptolemy Soter, who with his descendants formed the dynasty of the Ptolemies (323-30 B.C.) ending with Cleopatra. Ptolemy II. (Philadelphos) established a magnificent court, the most learned of ancient times, but his successors lost all, and their history is only a record of dissolute quarrels.

After the Roman Conquest.—In 50 B.C. Egypt passed under the guardianship of Rome. Cæsar, by his marriage to Cleopatra, legalized his authority in Egypt, and made himself an Oriental sovereign. But the steady drain which Rome imposed, with the extortion of governors, depleted even the capital wealth of Egypt. Drained by a new claim, the growth of Christian monasteries which absorbed much labor, deprived of its population, torn by religious controversies, bled by Byzantine spendthrifts, Egypt at length accepted even the Persians in 616 A.D., and the Arabs in 641 A.D., as possible improvements. From 641 to 868 A.D. wealth and capital began to grow again; and with the steady growth of Islam, internal peace and prosperity were restored. The dynasty ending 1169 A.D. saw the climax of Egyptian wealth fed by the commerce of the East, and with out foreign drain. Troubles with the half-barbarous crusaders threw the land into the hands of the Kurd Saladin, whose rule (1171-1193) is perhaps the most brilliant of the middle ages. From 1250 to 1517 A.D. Egypt was governed by a succession of slave kings—the Mamelukes—distinguished for their valor. In 1517 Egypt was made a Turkish province, and for nearly three centuries was at the mercy of the corrupt government of the Turkish pashas.

Modern Egypt.—In 1882 measures were taken for the reorganization of the country, under the nominal autocracy of the Sultan and the legal autocracy of the Khedives but with the British representative in actual control.

The advance of Egypt in culture and prosperity since 1882 has been marked. By the Anglo-French Agreement of 1904 (binding

for thirty years) France formally recognized the predominance of Great Britain in Egypt and agreed in no way to obstruct British action there. During the World War Egypt served as an important depot for the training and despatch of British and colonial troops. The Suez Canal was strongly fortified and a number of Turkish attacks with that as an objective were defeated. In the period immediately following the War, the extreme nationalist movement, dating from about 1906, assumed increasing importance and early in 1919 serious disturbances occurred. On Feb. 28, 1922, Egypt was declared an independent sovereign state with certain Protectorate reservations made by Great Britain. On March 16, 1922, the Sultan Fuad Pasha assumed the title of king. In 1923 a constitution was adopted declaring Egypt to be an hereditary monarchy with a representative government. British martial law, proclaimed in 1914, was abolished July 5, 1923. The first parliament convened March 15, 1924. There has been considerable disturbance in Egypt since 1924 between the English and the Egyptians over the management of the Sudan, resulting finally in Egyptian recognition of the authority of British financial and judicial advisers.

King Fuad died April 28, 1936, and was succeeded by his son Faruk, who was sixteen years old. On August 26, 1936, an Anglo-Egyptian treaty was signed in London terminating the military occupation of Egypt by British forces, but providing for a garrison of 10,000 British troops and 400 airplanes to guard the Suez Canal. This provided, moreover, that the British would have the right to employ Alexandria and Port Said for naval bases and to move troops over Egyptian territory in case of need.

On Sept. 5, 1939 Egypt severed diplomatic relations with Ger. and in 1939-40 served as a base for the Near East military forces of England. June 25, 1942 the Germans penetrated into Egypt and it became a major scene of the global war. Rommel's forces were driven from the country Oct.-Nov., 1941.

On ANCIENT EGYPT, consult Maspero's *Manual of Egyptian Archaeology*; Poole's *Egypt in the Middle Ages*; Wiedmann's *Religion of the Egyptians*; Budge's *Egyptian Sudan: Its History and Monuments*; Breasted's *History of Egypt* (1906); Petrie's *Diospolis Parva, History of Egypt, and Arts and Crafts of Ancient Egypt* (1910). On MODERN EGYPT: Sydney's *Egypt in Transition* (1914); Ball's *Egypt of the Egyptians* (1915); Traversers-Symon's *Riddle of Egypt* (1915); Weig-

all's *A History of Egypt from 1763 to 1914* (1915); Symon's *Britain and Egypt* (1925); Harris' *Egypt under the Egyptians* (1925).

Egypt Exploration Fund, a fund originated in 1882 by Miss Amelia B. Edwards for the purpose of investigating and excavating ancient sites in Egypt. Antiquities discovered under its auspices must first be offered to the National Museum of Egypt, but when its claims are satisfied, the remainder are divided between the British Museum and various public collections in Great Britain, America, and the British Colonies.

Egyptian Architecture. No clew is afforded to the probable date of Egyptian architecture until the age of the pyramid builders is reached (4000 years B.C.). At this time, the height of perfection to which they had attained—the scientific skill and artistic power shown in the treatment of the tombs and the delicacy revealed in their statuary—is evidence of a very high development in art. At Medum a small temple discovered by Professor Flinders Petrie, dating about 4000 B.C., shows the plan and style of the later dynasties. The tendency which led to the gloomy interior so universally found in Egyptian temples is here seen. The altar stands in the inner compartment, and an arrangement of walls, of lock and key device, makes access difficult and almost wholly excludes light. Many features of these early structures suggest the use of timber at a previous date.

The temples which come later are elaborate, their walls sloping upward, the entrance gate being flanked on each side by pylons of great height and fantastic workmanship, with the entrance low and narrow. There is a large colonnaded courtyard, approached generally by steps; and within, a smaller court decorated with colossi and supported by columns. The interior, though magnificent, is always gloomy and forbidding. The outer walls of these are perpendicular. The constructional system of the Egyptians consisted in roofing over spaces with large horizontal blocks supported by columns. In Middle Egypt are found the earliest known examples of the subsequent Greek column, and other features further typify the elements of trabeated architecture. Roofs are flattened, openings are small and square headed. In the tomb of Beni-Hassan fluted columns seem to support an arched ceiling, while the entrance is flanked by fluted columns, and a façade of great architectural beauty forms the superstructure. The walls are thick, built of granite and

stone, and there are evidences that brick had been known and used.

Egyptology, the scientific study of ancient Egyptian civilization, is based upon a vast number of monuments which, because of especially favorable climatic conditions, have come down to us from early ages in an excellent state of preservation. These include temples and tombs, the walls of which are covered with hieroglyphic inscriptions and pictorial representations; tables of stone and clay; papyrus rolls; obelisks; and numerous documents and objects of daily life entombed with mummies for their use in the underworld.

The modern science of Egyptology may be said to date from the sixteenth century, when European scholars made the first attempts to decipher the Egyptian hieroglyphics; travelers began to collect specimens of early Egyptian craftsmanship in the seventeenth century; and in 1798 a scientific commission of artists and archaeologists accompanied Napoleon's great military expedition into Egypt. The discovery by this commission of the Rosetta Stone, with its parallel inscriptions in hieroglyphic, Demotic, and Greek characters, marks the beginning of real progress in the study of Egyptian antiquities. Dr. Thomas Young, an English physicist, made the first important attempts to decipher these inscriptions. The real foundation of our knowledge of the language, however, was laid by the famous French scholar, Jean François Champollion. In 1866 Lepsius published the first translations of complete Egyptian texts and made important advances in grammar; and Brugsch in 1867-82, published an influential thesaurus of the Egyptian language in 7 volumes.

Archæological explorations and the collection of antiquities paralleled the study of the language; and in 1858, at the instance of the French government, a director of archæological works was appointed by the state. The work thus begun was continued under the British occupation, and there is now a thoroughly organized Service of Antiquities. The recent discoveries include: 1. Under the auspices of the Egyptian University at Tuna, the ancient city of Hermopolis, in which a temple tomb, dating from the first century A.D. was uncovered in perfect condition; 2. under the auspices of the University of Pennsylvania, Meydum, the largest sarcophagus ever found in Egypt, dating to about 2900 B.C.; 3. under the auspices of the British Museum, work at El Matmar has produced

many objects which help in piecing together the fragments of ancient Egyptian history. Consult New *Archeological Discoveries* (1929).

E.H.F.A., Electric Home and Farm Authority. See UNITED STATES, NEW DEAL.

Ehrlich, Paul (1854-1915), German physician and scientist, is most widely known for his discovery in 1910 of salvarsan and neosalvarsan, specifics for syphilis. Other achievements of far-reaching importance are his methods of bacterial staining, used in the micro-chemical differentiation of leucocytes; the development of the methylene blue reaction of living tissues; the standardization of diphtheria antitoxin; the formulation of the side-chain theory of immunity; and important studies in sleeping sickness. He published numerous works on his studies.

E.-I. B., Export-Import Banks. See UNITED STATES, NEW DEAL.

Eibar, town, Spain, famous for its guns and swords, and especially for the beautiful damascened-iron objects called *Eibar work*.

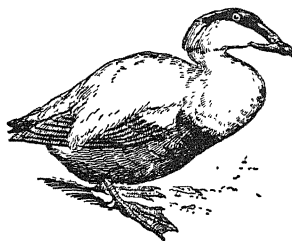
Eichendorff, Joseph von (1788-1857), German poet, one of the last of the German romanticists. His lyrics, far more than his prose works, have secured a lasting place in German literature; their simplicity and genuine warmth, their musical quality, their feeling for nature having made many of them true Volkslieder.

Eichstätt, or **Eichstätt**, town, Bavaria. Its cathedral contains the tomb of St. Willibald, who founded a bishopric here in 741. Here also is the tomb of St. Walpurgis, which exudes a miraculous oil, and attracts numerous pilgrims.

Eider Duck (*Somateria*), a genus of birds in the duck family (Anatidæ), included under the larger division of geese or Anseres. The bill is as long as the head, laterally compressed, and bears on each side of the root an unfeathered peak extending backward; the point of the bill bears a large hooked horny nail; the tail is short and pointed. The birds are restricted to northern regions, where they breed socially. The common eider duck (*S. mollissima*) lives on the Arctic and northerly shores of the Atlantic in both hemispheres, being common in Novaya Zemlya, Spitzbergen, Iceland, and Greenland; various species also are found in Alaska and the neighboring islands. The eider measures about two ft. in length, but is heavy for its size. Of the females and young males it may be said that the color is predominantly rusty brown, with dark streaks and spots. The adult males,

however, have a more complex plumage, especially in the breeding season.

The fine elastic gray down, so much used, especially in Europe, for bed clothes, is chiefly developed on the breast of the bird. The best quality is not taken from the bird directly, but gathered from the nest. The common practice in Norway and Iceland is to take



Eider Duck (male).

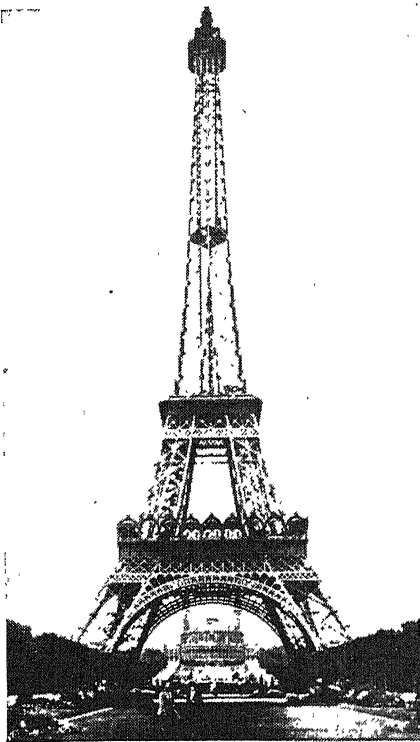
away the eggs and down twice, leaving the third set of eggs to continue the species. The nests are carefully protected, and are transmitted as valuable possessions. Besides the common eider, several other species are known, of which two, the King Eider (*S. spectabilis*) and Steller's Eider (*S. Stelleri*), are circumpolar, while the American Eider (*S. Dresseri*) is peculiar to Northeastern America, and the Pacific Eider (*S. v-nigra*) to Alaska.

Eifel, elevated volcanic region of Prussia, lying between the Rhine, the Moselle, and the Belgian frontier. It forms an undulating plateau, seamed by picturesque valleys, such as that of the Ahr. The most widely spread formation is basalt. Alt. from 1,200 to 2,500 ft.

Eiffel, Alexandre Gustave (1832-1923), French engineer, born in Dijon. In 1865 he founded at Levallois-Perret (department Seine) an iron works. He built the famous Garabit viaduct in the department Cantall in 1882; the big bridge over the Douro at Oporto in 1876; the movable dome of the observatory at Nice; and the framework for Bartholdi's colossal statue of Liberty in New York Harbor. He also invented a type of movable section bridges first used in 1885. In 1893 he was condemned to two years' imprisonment and a fine of \$4,000 for breach of trust in connection with the Panama Canal works.

The *Eiffel Tower* was erected by him for the exposition of 1889 at Paris. It stands in the Champ de Mars, and is 984 ft. high (429 ft. higher than the Washington Monument). The base is a square of 112 yards, from each

corner of which rise the four curving supports of interlaced ironwork. At a height of 590 ft. these coalesce into a single shaft. There are three platforms at various heights, to which the ascent is made by elevators or staircases—1,927 steps in all. The total cost was over \$1,000,000, of which the state contributed about \$300,000. In 1909 the Tower became the property of the city of Paris. It has since remained in the ownership of that city.



The Eiffel Tower, Paris.

Eight-Hour Day. Originating in England early in the 19th century, agitation for the eight-hour working day reached the United States in the fifties. It was demanded by the National Labor Union in 1866 as conducive to the highest efficiency of labor and the greatest welfare of the workingman, and was introduced by law into the U. S. navy yards in 1869. In the last half century it has been applied by legislation to all other Federal Government work, to public work conducted by many of the States, and to various pri-

vate industries, either as the actual working period or as the standard for reckoning compensation—the basic eight-hour day.

The governmental eight-hour system was first applied to private industry by an act of 1892, which directed contractors with the United States for labor on public works to observe an eight-hour day; an act of 1911, provided that no part of the appropriations made for submarine construction was to be expended by any person, firm, or corporation which had not granted the eight-hour day to all laborers and mechanics doing such work; an act of 1912 extended the principle to other work done under contract for the National Government. In recent years legislative regulation of hours of labor has been extended to many private enterprises.

In September, 1916, to avert a threatened strike of the four great railroad brotherhoods of the United States, President Wilson urged immediate legislation by Congress, then in session. The Adamson Act was thereupon enacted into law, being passed by the House on Sept. 2 by a vote of 239 to 56, and by the Senate on Sept. 3 by a vote of 43 to 28. This Act provided that, beginning Jan. 1, 1917, eight hours should be deemed the standard or measure of a day's work, for the purpose of reckoning the compensation of employees engaged in the operation of trains—except independently owned and operated railroads less than 100 m. in length, and electric street and railway employees subject to the Act should, for all necessary time in excess of eight hours, be paid at a rate not less than the *pro rata* for such standard eight hours of work.

In 1938 was enacted the C.I.O.-sponsored wage and hour law, called the Fair Labor Standards Act, another New Deal panacea to increase the wealth of the American people by having them do less work. This law, complicated and puzzling even to lawyers, placed another burden on hard pressed American industry already staggering under increasing taxes and the effects of the National Labor Relations Act and other New Deal innovations. Among the features of the wage and hour law are provisions for a maximum week of 44 hours and a minimum wage of 25 cents per hour, to develop progressively to 40 hours and 40 cents respectively. The law provides for an administrator and a staff of aids, etc., with power to step up minimum wages; and relief from the administrator's mandates and penalties is possible only by costly appeal to the courts. There are also provisions whereby goods may not be shipped in commerce if

there be any oversight of observance of any phase of the law or the orders promulgated by the administrator. By the following year (1939), various industries had been unable to realize the benefits intended to accrue from spending more for production. Forced to sell for lower prices on a falling mercantile market, many were forced to curtail employment and were experiencing increasing difficulty in keeping their plants in operation. Elmer F. Andrews of New York was the first administrator of the Fair Labor Standards Act. He resigned Oct., 1939, and was succeeded by Lieut.-Col. Philip Fleming, formerly army district engineer. See AMERICAN FEDERATION OF LABOR; TRADE-UNIONS; NEW DEAL; CONGRESS OF INDUSTRIAL ORGANIZATIONS.

Eight, Piece of, the old Spanish *piastre* or peso, now called a dollar, thus known throughout the Spanish Main, because it was divided into eight reals. It was a silver coin worth about one dollar in U. S. money.

Eikon, Basilike (*The Portraiture of His Sacred Majestie in His Solitudes and Sufferings*), was published immediately after the execution of Charles I. of England (1649), and within a twelvemonth ran through fifty editions in various languages. Written in the first person, it professes to be Charles' own composition.

Eildon Hills, a short range of hills with three peaks—in the parishes of Melrose and Bowden, Roxburghshire, Scotland. At the foot of these hills are the remains of a great Roman encampment. See MELROSE.

Eilithyia, a city of ancient Egypt which stood on the banks of the Nile, 40 m. s. of Luxor or Thebes. It was sacred to the Egyptian goddess of childbirth, *Nekheh*, whose name the city bore in ancient times; Eilithyia is the name of the corresponding Greek goddess. The place is now known as *El Kab*. Names of kings as early as the Sixth Dynasty (3400 B.C.) are found near it, as well as some of the Twelfth (2600 B.C.) and Eighteenth (1500 B.C.). It contains the ruins of three temples—one of Ra, erected by *Rameses III.*; one of *Nekheh* or Eilithyia, built by *Ptolemy Euergetes II.* (or *Physcon*); and another of *Nekheh*, the work of *Amenhotep III.* (1400 B.C.), which contains some good drawings and paintings.

Eimbeck. See **Einbeck**.

Eimeo, Aimeo, or Moorea, one of the French Society Islands, Pacific Ocean. The island is one of the chief stations of the London Missionary Society, who have their South Sea College here. Population 1,600.

Einbeck, or **Eimbeck**, town, Prussia. The modern 'bock' derives its name from the Eimbecker beer of the 15th century; p. 10,-250.

Einhard, less correctly **Eginhard** (770-840), historiographer. He was a favorite of Charlemagne, who employed him in many important affairs. Einhard's *Life of Emperor Karl* the Great is the best existing account of Charlemagne and his times.

Einsiedeln, town, Switzerland, in the canton of Schwyz. It has grown up round the great Benedictine monastery which was founded here in the 10th century and is still flourishing. Its famous black statue of the Virgin and Child attracts many pilgrims; p. 9,600.

Einstein, Albert (1879-), German-Swiss scientist, was born in Ulm, Germany, of Jewish parentage. In 1921 he received the Nobel Prize and has also been the recipient of many other prizes and medals. His most important work is *The Theory of Relativity* (1915-17). See EINSTEIN THEORY. He was summoned to Oxford and Cambridge universities during 1931-32 as a special lecturer. Political necessity forced him to give up his home in Germany in 1933 and come to America. He was immediately appointed a life member of the Institute for Advanced Study at Princeton University, N. J. He became a U. S. citizen, 1940. His latest publications, besides several contributions to scientific periodicals, include *My Philosophy* (1934), *The World As I See It* (1936).

Einstein Theory, or Theory of Relativity. 1. Restricted Principle of Relativity.—The Newtonian laws of mechanics are based upon the conceptions of absolute space and time. By absolute time we mean time as we have been accustomed to consider it, a continuum running from eternity to eternity, the same everywhere; by absolute space the space whose properties are set forth in the plane and solid geometry of Euclid. We speak of the latter as three-dimensional, meaning crudely that there are three such things as length, breadth, and thickness, or, more precisely, that any point of space may be uniquely determined by three numbers x_1, x_2, x_3 , called the *coordinates* of the point.

For some time the physicist has thought of all space as being filled with a stationary substance, called the ether, which is the medium for the propagation of light, electricity, and magnetism. It had been determined that a wave of light was propagated through this medium with a velocity of 180,000 m. per

second. A natural problem was to determine the velocity of the earth through the ether by means of light. This was undertaken in 1887 by Michelson and Morley, and the calculations were based upon the idea that measurements of space and time are the same when made on a body moving in a straight line with constant velocity (*i.e.* uniform motion) as when made by an observer at rest in absolute space, and that the results can be co-ordinated by means of the principle of composition of velocities referred to above; but, although the experiment was sufficiently accurate to detect the velocity of the earth, it failed to do so. Other experiments have given the same negative result, and physicists have accordingly announced the following *restricted principle of relativity*: *It is impossible by any experiments to detect uniform motion relative to the ether.*

If we assume that this principle holds, and that the velocity of light is a constant independent of the motion of its source, we are led to certain mathematical equations giving the relations between distances measured from a point fixed in space and from a point on the moving body, and the time-intervals measured at the two points. They are called the equations of the Lorentz transformation. Their physical interpretation is that distance between points is not absolute but depends upon the motion and position of the observer; the same is true of the measure of the time-interval between events. In other words, the magnitudes of observed space-intervals and time-intervals are relative to the observer.

We have seen that the law that the propagation of light is independent of the velocity of the source is equivalent to the Lorentz transformation. In like manner, in accordance with the restricted principle of relativity, every general law of nature must be so stated in one set of variables that it is transformed into the same form in another set of variables by the Lorentz transformation; that is, general laws of nature are covariant with respect to Lorentz transformations. By the combined efforts of Lorentz, Larmor, and Einstein it has been shown that Maxwell's equations of an electromagnetic field have this invariant character.

2. *General Principle of Relativity.*—The restricted principle of relativity deals with uniform motion. Its bearing on the theories of light and electro-dynamics has been pointed out. There remained for consideration the two problems of curvilinear motion and gravi-

tation. These are problems which Einstein has dealt with in his general theory of relativity.

According to Newton's law of gravitation, two bodies attract each other with a force proportional to the product of their masses, and inversely as the square of the distance between the bodies. From this law the paths of the planets about the sun have been calculated, and these calculations have agreed with observation with one exception, the motion of Mercury. This discrepancy has been known for two hundred years, and all efforts by astronomers to account for it have been unsatisfactory. Newton's law is based upon the principles of absolute space and time, and deals with action at a distance. The Einstein law is based on the principle that the character of physical space is determined by the presence of matter in its neighborhood, that it is not euclidean, and that the degree of its difference from euclidean space is determined by the presence of matter. Riemann and Clifford may have had this idea in mind, but it remained for Einstein to give the principle exact mathematical formulation.

Riemann developed the idea of spaces of any order of dimensions. Thus he defined a space of four dimensions as a continuum, each point of which may be represented continuously by four independent quantities, called the co-ordinates of the point. As thus defined, there is no means of determining distances between points. Hence, there must be added to the definition a metric, an expression involving the co-ordinates of a point and the co-ordinates, relative to the point, of a nearby point. When another set of co-ordinates is defined in terms of the given ones, the expression for the metric is transformed into a new form. If it is possible to choose a set of co-ordinates so that the metric is reducible to a form for four co-ordinates analogous to the metric of euclidean three-dimensional space for cartesian co-ordinates, we say that the space is euclidean, or flat; otherwise it is a curved space. Riemann expressed this condition in terms of the coefficients of the metric for any system of co-ordinates; that is, he expressed it in a form covariant with respect to the co-ordinates.

We have been taught that the shortest distance between two points in a plane is measured along the straight line determined by the two points; that the shortest distance measured on a sphere between two points is measured along the great circle determined by the two points. For any surface there is a curve of shortest length between two points

on the surface. These curves are called *geodesics*. The geodesics of any Riemann space are defined by differential expressions covariant with respect to the co-ordinates used.

Einstein conceived the idea of treating physical phenomena as geometrical properties of four-dimensional Riemann space. When the Riemann space is such that the coefficients of its metric satisfy certain conditions, expressed in a form covariant with respect to the co-ordinates used, we have the phenomena of a gravitational field. The motion of a body in the gravitational field is defined by the properties of the geodesics of the four-dimensional space. Einstein identified certain types of these spaces with the case of a planet revolving about the sun, and obtained the equations of the orbit of the planet. These equations differ little from those obtained by Newton, but they account for the discrepancy in the motion of Mercury referred to previously; in the case of other planets the differences are too small to be detected by experimental methods now available.

In the classical mechanics the mass of a body is defined to be a property of it independent of its position and motion; by some it is called the quantity of matter in the body. The restricted principle of relativity and the general principle of relativity of Einstein compel us to give up this idea and to hold that mass changes with motion. According to Einstein, the paths of light are geodesics of a certain type in the Riemann space of a gravitational field. He calculated to what extent a ray of light passing near the sun should be deflected in accordance with his theory. On May 29, 1919, observations were made by a group of British scientists at Sobral, Brazil, during a total eclipse of the sun, and his prediction was verified, thus giving a second confirmation of the Einstein theory.

Thus far we have referred only to the law of gravitation in the general theory of relativity. The theory has been applied also to the phenomena of thermodynamics and electrodynamics. An exposition of these applications cannot be given here, but it should be said that the mathematical equations of these phenomena are expressed in form covariant with respect to the co-ordinates. This is a fundamental principle of the Einstein theory.

Einstein's fundamental point of view is that gravitation and electromagnetism are properties of the space-time continuum and that the discovery of the exact character of the latter can be accomplished only by math-

ematical speculation. This was the process followed by him in his former theory of gravitation and he chose a space which was nearly euclidean. Now he chooses for the unified field a space which is not euclidean but for which there is absolute parallelism. Furthermore, he particularizes the choice by specifying that the vector-fields underlying the definition of parallelism shall satisfy certain mathematical equations, these equations being, as appears to him, the most natural ones to choose which to a first approximation agree with known results on gravitation and electromagnetism. At present the theory is in this speculative state. Whether it fits the facts of nature more than approximately will have to be determined by experimental investigation.

Eire, name for the IRISH FREE STATE, adopted in 1937. See IRELAND.

Eisenach, town and summer resort, Germany, in Saxe-Weimar. Situated 725 ft. above sea level at the n.w. end of the Thuringian Forest, on the River Hösels; 35 miles by rail w. of Erfurt. On an eminence rising 600 ft. above the town stands the castle of *Wartburg*, founded in 1067, and till 1440 the residence of the landgraves of Thuringia. It is famous as the spot where the Minnesingers assembled to hold a poetic contest about 1207. It was the birthplace of J. S. Bach.

Eisenhower, Dwight D. (1890-), U. S. army officer, was born Oct. 14, 1890 at Denison, Texas; was graduated from West Point in 1915; instructed troops in World War I; was Gen. MacArthur's chief of staff, 1935; Lt. General, 1942; General and Commander of Allied forces in western Europe, 1943-45. He led the successful campaigns in Africa and Italy and the final European campaign that led to Germany's surrender in 1945. At the conclusion of the war he was in command of the German territory which was under U. S. supervision and was a member of the Allied Control Council.

Eisenstadt, or **Kismatron**, town, Austria. It is the seat of the beautiful palace of Prince Esterházy, erected in 1683; p. 3,500.

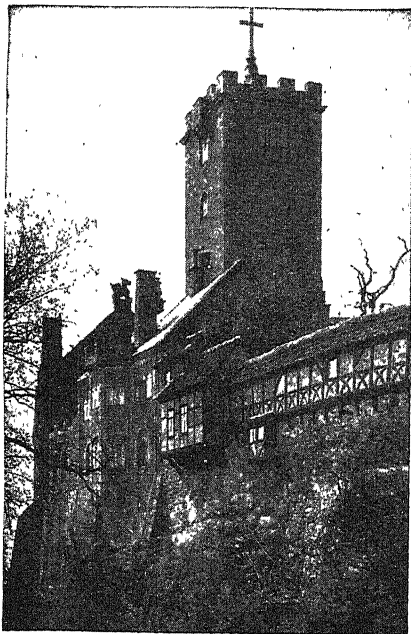
Eisleben, town, Germany, in Saxony, in which Luther was born (1483) and died.

Eisteddfod, (plural **Eisteddfodau**), formerly a gathering held for the election of Welsh chief bards, probably an outgrowth of the ancient Gorsedd, or Druidic congress. The objects of the modern Eisteddfod are the cultivation and preservation of Welsh poetry,

music, and tradition. The first Eisteddfod of which an account survives was held at Conway in the 6th century.

Ejected Blocks are masses of sedimentary or igneous rock which have been torn from the walls of a volcanic crater and cast out by the explosions of steam which accompany an eruption.

Ejectment is an action to recover possession of real property with damages for the detention thereof. It is a mixed action, since



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The Wartburg.

Famous because Martin Luther was hidden there by the elector of Saxony, Frederick, after the Diet of Worms.

both damages and land are recovered. It originated in the ancient writ of *ejectione firmæ*, which gave a restricted remedy in the nature of trespass, and which was first employed in 1371. About a hundred years later the courts extended the form of the judgment so that a term of years from which the lessee had been ousted might be recovered by this action. The action was strictly applicable only to a term of years, but by the aid of fictions it superseded the more cumbrous real actions and became the sole means of trying title to lands. The fictitious feature of the action was

abolished in England in 1852, and has been abolished in all of the United States, but ejectment still remains the mode for the trial of title in nearly all of the states. In some an action for the recovery of land is on the same footing as any other action. This has been the law in England since 1875. See Blackstone, *Commentaries on the Laws of England*; Powell, *Practical Treatise on the Law of Ejectment* (1911).

Ekaterinburg, or Yekaterinburg, a fortified city in the former Province of Perm, Russia, now Sverdlovsk, U. S. S. R. Besides two cathedrals, it has an old mint and the central assay for the gold of the Ural mines; p. 146,800.

Ekaterinoslav, or Yekaterinoslav. (1.) Government in former S. Russia, bounded on the s. by the Sea of Azov and Taurida (Crimea, etc.). (2.) City, now Dnepropetrovsk, cap. of above gov't., on the r. bk. of the Dnieper, which is here crossed by a two-storied bridge (4,147 ft.). The most important industry is iron-working, of which this is one of the greatest Russian centers; p. 187,644.

Elæagnus is a genus of beautiful shrubs and small trees belonging to the order Elæagnaceæ. They all have handsome foliage and fruit, and most have small, salver-shaped, fragrant flowers. The Elæagni are popularly known as oleasters or wild olives. *E. argentea*, a silvery-scurfy shrub, with edible silvery berries, is found in the northern United States and Canada. It is known as 'silver-berry.'

Elæocarpus is a genus of tropical shrubs and trees belonging to the order Liliaceæ. They are mostly natives of the Indian Archipelago and Australasia.

Elæococca is a genus of evergreen tropical trees belonging to the order Euphorbiaceæ. Some of the species yield useful oils, and others a lac varnish. The various species are now included under Aleirites.

Elæolite, a variety of nepheline which occurs in crystalline, plutonic rocks, and is of a gray or bluish-gray color when fresh, with a greasy luster, which is due to the presence of innumerable minute enclosures. It is an essential mineral in Elæolite Syenite.

Elagabalus, or Heliogabalus, emperor of Rome from 218 to 222 A.D. His original name was Varius Avitus Bassianus; he obtained that of Elagabalus from being made priest to the Syro-Phœnician sun-god, Elagabal.

Elam (anc. *Elymais*), a country of W. Asia, embracing part of the mountainous region of Babylonia. It possessed two important

cities—Susa or Shusan, on the Eulæus or Choaspes; and Anzan, near the Babylonian border.

Eland, the largest of the antelopes, standing about 6 ft. tall. Two species are known, both of the genus *Oreas*, characterized by the presence of horns in the female sex as well as in the male, and by the fact that these horns are spirally twisted on their own axis, are directed upwards and outwards, and have a sharp ridge both in front and behind. It remains numerous only in German East Africa.



Head of Eland.

El Arish, fort. city and gov. of Lower Egypt, on the Mediterranean. In the middle ages it was known as Laris; p. 17,000.

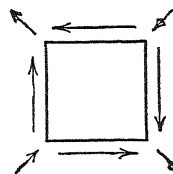
Elasmobranchs, an order of fishes which includes the sharks and rays. They are usually divided into two sub-orders—Selachoides, including the sharks and dog-fish, which have approximately cylindrical bodies with lateral gill clefts; and Batoidei, the skates and rays, with flattened bodies and ventral gill clefts.

Elasmosaurus, a genus of extinct reptiles belonging to the family of plesiosaurs. In Philadelphia there is a skeleton of a member of this genus 45 ft. in length. It inhabited the seas which in Upper Cretaceous time occupied the central region of N. America.

Elasticity, the property of matter in virtue of which it resists forces tending to change bulk or form, and recovers the original bulk or form when the forces are removed. If we use the word *strain* to express the change of form or bulk or of both combined, and the word *stress* to express the combination of forces associated with the strain and required to sustain it, then the theory of elasticity is that branch of dynamics which discusses the mutual relations of stress and strain. The fundamental strains in an isotropic body are two—viz. the compression or change of unit volume, and the shear or simple change of form without any change of volume. The

stress which corresponds to the compression is the hydrostatic pressure which is equal in all directions, and perpendicular to the surfaces on which it acts. To the simple shear there corresponds the shearing stress, which is most simply conceived of as a pair of two equal and opposite forces acting tangentially along four of the sides of a cube. The ratio of the stress to the accompanying strain, is called the rigidity, or the 'form modulus,' of elasticity. Within certain limits the stress is proportional to the strain, in accordance with Hooke's law; in other words, the rigidity is constant.

In gases, the law of elasticity is Boyle's law, which states that at constant temperature the volume is inversely as the pressure. In liquids and solids, in which the compression is very small, we may within ordinary practical limits use Hooke's law, and put the compressing force proportional to the compression. The ratio of the stress to the strain in this case is called the 'bulk modulus.' It is the reciprocal of the compressibility. But although the compressibility by itself is of little importance, it enters along with the rigidity into all questions of strength of materials. From the en-



Diagram, Stress and Strain.

gineer's point of view the most important strains are bending, longitudinal stretching and compression, twisting, and the strains involved in the action of high pressures within tubes and boilers. The ratio of the stress estimated per unit area, the total load divided by the area of section, to the extension, gives the number known as Young's modulus. This, however, is not a simple or fundamental elastic modulus. For when the bar is drawn out it suffers contraction in all directions at right angles to the direction of the pull. Thus, a longitudinal pull does not give rise to a simple longitudinal strain. The strain is complex, and Young's modulus involves both the fundamental moduli.

In simple flexure or bending, the resistance to bending, or the flexural rigidity, depends on the form and size of the section and upon Young's modulus of the material. In engineering structures it is important to get the

maximum of strength with the minimum of weight. As regards flexural rigidity, a hollow cylinder is no stronger than a solid bar of the same section; but the latter is much heavier, and in virtue of its weight is subject to greater forces than the cylinder. In the celebrated Forth Bridge in Scotland the struts are large hollow cylinders capable of supporting immense thrusts without buckling; the ties, on the other hand, require only to resist tension, and are made in the form of comparatively thin rods. Another method of strengthening a rod against bending is to enlarge the section in the direction perpendicular to the axis of bending. Thus, a T or \perp shaped rod will resist any combination of forces tending to bend it much more effectively than a cylindrical rod of the same length and weight. See *Mathematical Theory of Elasticity* (1887) and Love's *Mathematical Theory of Elasticity* (2 vols., 1892-3); Lamb's *Statics, Including Hydrostatics and the Elements of the Theory of Elasticity* (1912).

Elatea, tn., Phocis, ancient Greece, close to an important pass from Thessaly to Bœotia. This town was seized by Philip of Macedon in 338 B.C. It is the modern Drachmani, and near it were discovered in 1883 the remains of a temple to Athena Cranæa.

Elaterite, a natural bitumen, soft, brown, and elastic. Some specimens have a considerable resemblance to india-rubber. It is found in the lead mines of Castleton in Derbyshire, England, at St. Bernard's Well, Edinburgh, and in a few other localities.

Elaterium, a green deposit formed by expressing and drying the juice of the unripe squirting cucumber. It is a very powerful hydragogue purgative, and is seldom used save in dropsy or uræmia.

Elba, isl. off the w. coast of Italy, midway between Leghorn and Civitavecchia. It is chiefly memorable as the first place of detention of Napoleon I. (May 1814, to February 1815).

Elbassan, tn., in the vilayet of Monastir, European Turkey. Westwards is the monastery of St. John founded 1000 A.D.; p. 15,500.

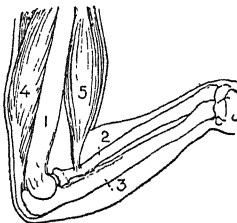
Elbe, one of the most important rivers of Germany, rises on the s. side of the Riesengebirge, at an alt. of 4,500 ft. Several canals connect the Elbe with the Oder, through the Havel and the Spree, and with the Baltic through the Trave. Total length of river, over 720 m.; area of drainage basin, some 55,000 sq. m. Chief tributaries the Moldau, Eger, Mulde, and Saale from the left, and the Elster and Havel from the right. The last of

the tolls levied on the navigable part of the stream was abolished in 1870.

Elberfeld, tn., Prussia, prov. Rhineland. It is the seat of a very extensive manufacture of cottons, woollens, and silk, buttons, cords, ribbons, tassels, etc., dyeing, bleaching, calico printing, the production of chemicals and colors, brewing, iron and steel works and various other industries; p. 173,000.

Elbing, seapt. tn., Prussia, prov. W. Prussia. Here is one of the largest shipbuilding yards of Germany; p. 71,000. THE ELBING OBERLAND CANAL connects a number of lakes in E. and W. Prussia with the navigable part of Elbing R. in the n., and with the Drewenz-Schillingsee Canal in the s.

Elbow, the joint between the fore arm and upper arm. It is an example of the hinge-joint, and is formed between the humerus above and the ulna and radius below. The



Elbow-joint.

1, Humerus; 2, radius; 3, ulna;
4, triceps; 5, biceps.

joint is liable to fractures of the bones inside the capsule, and to dislocations of the ulna or the radius, or of both, most commonly backwards. Unless carefully set, with special splints, and treated by passive movement as early as possible, a fracture at the elbow-joint is liable to leave a permanent stiffness.

Elbruz, the highest mountain in the Caucasus range. It is an extinct volcano with two peaks, the western peak 18,470 ft. above sea-level, the other 18,347.

Elburz Mountains, mountain range of Persia, running e. and w. for about 500 m. along the s. shores of the Caspian Sea, at a distance varying from 20 to 500 m. The Kharzan Pass (7,500 ft.) is one of the chief passes from the Caspian to the interior *viâ* Teheran.

El Caney, tn., province of Santiago, Cuba; was the scene of the first severe land battle (July 1, 1898) in the Spanish-American War. After the war the U. S. Government pur-

chased the battlefield, with the old Spanish fortifications, for a public reservation.

El Capitan, a rocky peak in Yosemite Valley, rising in an almost sheer precipice to the height of 7,630 ft. See YOSEMITE.

Elcesaites. See **Elkesaites**.

Elche, city, Alicante province, Spain. Important excavations for Roman remains have been carried on in the neighborhood; p. 30, 713.

Elchingen, or **Oberelchingen**, village, Bavaria, Germany. It was the scene of Ney's victory over the Austrians (Oct. 14, 1805), for which he received the title Duc d'Elchingen.

Elder (Greek *presbyteros*), in ecclesiastical usage, a word which has several distinct significations, yet all closely allied to the primitive meaning—a person who by virtue of years and experience occupies a position of re-

ate. In churches holding to the Presbyterian system the eldership is a parish office filled by laymen chosen or appointed in various ways, inducted into office with varying ceremony, and with tenure of office varying in length. They comprise the lay element in the presbyteries, synods, and assemblies of the church, possessing equal rights with ministers as regards speaking and voting. See PRESBYTERIANISM.

Elder, a name applied to some twenty species of trees or shrubs of the genus *Sambucus*, of the family Caprifoliaceæ, occurring in wide distribution throughout the temperate regions of the world. The Common Elder (*S. nigra*) of Europe is a large shrub, sometimes attaining a height of 20 ft., bearing large compound leaves and dense cymes of cream-colored flowers of a peculiar sweetish odor, followed by small purplish black berries. The young elder branches from which the pith is easily removed are used for making whistles, pop-guns and other toys; the older wood is employed as a substitute for boxwood, while the flowers are used in the preparation of the elder-flower water of perfumers, and confectioners, and the berries in the making of elderberry wine. The American Elder, a common roadside shrub, closely resembles the European plant.

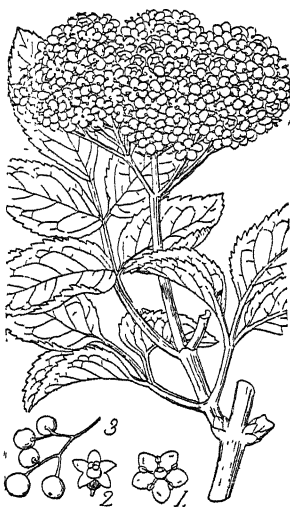
Elder, John (1824-69), English shipbuilder and marine engineer, was born in Glasgow, and was the first to experiment with and adopt compound steam-engines.

El Dorado ('the gilded'), a term originally applied by the Spanish explorers to the *Zaque* or ruler of a South American nation, said to cover his body with gold dust on the occasion of certain feasts. It was later used to designate a fabulous city or region of great riches variously located in different parts of the continent.

Eldorado Springs, city, Cedar co., Missouri. It has mineral springs and is noted as a health resort; p. 2,503.

Eleatic School, one of the pre-Socratic Greek schools of philosophy, so called from the town of Elea, its headquarters, a Greek colony in the s. of Italy. Its chief members were Parmenides and Zeno.

Elecampane, a tall, stout, herbaceous plant belonging to the Compositæ and closely allied to the Aster. Native to Middle and Southern Europe, it is naturalized in America, where it sometimes attains a height of 6 ft. It has very large, oval, wrinkled leaves with dentate margins, the stem leaves clasping the stem. The flower heads are large and yellow, and appear in late summer.



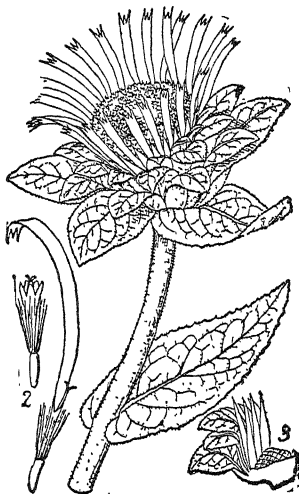
Elder (Sambucus nigra).

1, Flower; 2, flower without corolla; 3, fruit.

sponsible oversight of others. Among the Jews the elders were a class of functionaries who sometimes acted as judges, but were usually members of the administrative body in Hebrew towns and villages. In the apostolic church the elder or presbyter appears as one of the officials of the Christian community. After the Reformation, the term 'elder' was revived, but the office is not the same in all churches. Thus, among the Methodists, United Brethren, and others, it connotes a ministerial office superior in dignity to the pastor-

Election, in theology. See **Predestination**.

Election is an important doctrine, both of common law and equity, by which a person who possesses alternative rights, or is under alternative duties, is required to choose which of them he will enforce or perform. Thus if a person undertakes by contract to hand over one or other of two articles, he must decide which he prefers to part with, and after delivery his decision is irrevocable.



Elecampane.

1, Ray floret; 2, disc floret; 3, part of disc, showing involucre and scales.

Elections. An election is a choosing. Its processes have belonged to all times and peoples. Athenian voters cast oyster-shell ballots; Roman candidates campaigned in the market-place; and even today an African tribe may select its chief by the spinning of a cocoanut. Civilized peoples, however, have developed a complicated system of election machinery for rational choice by millions of electors, scattered over wide areas.

Election is said to be popular or direct when the officers are chosen by the great body of the voting population. In free government this is the prevailing form. Election is termed indirect or representative when it is confined to a small body whose members themselves have been chosen by the general group of electors. An election is said to be national when its purpose is the selection of national officers, such as members of the United States House of Representatives, who are chosen every two

years, and the President and Vice-President, who are chosen every four years. When the election is held for the choice of State officers, such as Governor, Lieutenant-Governor, and members of the State Legislature, it is called a State election. An election is termed municipal when it is held to select town, city, or county officials.

To prevent improper practices in voting and in registering the results, most states have passed various statutes. There have been many disputes concerning the validity and regularity of elections. Such disputes are settled by the courts or by special tribunals. The most famous was the Presidential Electoral Commission of 1877, composed of five Senators, five members of the House of Representatives, and five associate justices of the United States Supreme Court, which decided the election between Tilden and Hayes. According to the Federal Constitution each House of Congress is the final judge of the election of its members. A similar provision concerning State legislatures is in most of the State constitutions. The courts and not the House of Commons settle contested parliamentary elections in Great Britain. See **LOCAL GOVERNMENT**; **DISFRANCHISEMENT**; **REPRESENTATION**; **SUFFRAGE**, **WOMAN**. Consult *Hart's Actual Government*; *Dougherty's Electoral System*; *Merriam's Primary Elections*; *Jones' Readings on Parties and Elections in the United States*; *Martin and George's American Government and Citizenship* (1927).

Electoral College, in the United States, the body of electors in each State who have been chosen to select the President and Vice-President.

Electorate, the name given to the mass of voters as a whole. The organization of the constituent bodies is a matter of the first importance in countries which have adopted principles of representative government. The view taken by the Middle Ages of the nature of a political constituency was that it was to be above all things a commune or community. Generally speaking, also, the body of men forming the commune were invested with special privileges or 'franchises,' and were subject to special duties and liabilities. In England, reformers under the first Stuart kings began to criticise strongly a system of representation which gave the same number of members to populous Kent and Norfolk as to barren and thinly settled Lancashire and Cumberland, and which recognized the right of the king, by creating new parliamentary boroughs, to swamp the House of Commons

with representatives of petty towns subject to royal influence, while rising centers like Leeds and Manchester were unrepresented.

One of the most obvious applications of Rousseau's popular doctrine of the equality of men was their equal right to vote for representatives. The French Revolution gave powerful impetus and example to the plan of distributing the membership of representative bodies according to population. The United States put this idea into practice in 1789 in those parts of the Federal Constitution which provide that members of the National House of Representatives and presidential electors 'shall be apportioned among the several States according to their respective numbers.' The older idea of representation for communities as historical or political units or entities, regardless of their population, has its most striking exemplification in the equal representation of the States in the Senate of the United States, which gives to the 81,875 (1920) people of Nevada equal power with the 10,385,227 (1920) people of New York. There are two general plans for the choice of representatives on a popular basis, the very opposites of each other. The one plan divides a State or a municipality into as many territorial districts of equal population as there are members of its representative body, and permits each district to elect a single representative. The other plan does not divide the State or the municipality at all, but elects the entire representative body upon a general ticket by vote of the people at large. The first of these plans is by far the more prevalent in the United States, where it is practically universal for State legislative chambers. See REPRESENTATION; PROPORTIONAL REPRESENTATION; ELECTIONS. Consult Lowell's *Governments and Parties in Continental Europe*; Commons' *Proportional Representation* (1907); Bryce's *The American Commonwealth* (new ed., 1914); Beard's *American Government and Politics* (1914).

Elective System, a term employed to denote courses in colleges and secondary schools which may be elected, or chosen, by the students, as opposed to required courses. See CURRICULUM.

Electoral Commission, a special commission created by an act of Congress (approved Jan. 29, 1877) to decide the disputes growing out of the presidential election of 1876. That election called for the choice of 369 electors of President and Vice-President of the United States, of whom 185 would constitute a majority. The votes sent to the President of the United States Senate by all States but four

were not subject of dispute. These gave Tilden and Hendricks, the Democratic candidates, 184, and Hayes and Wheeler, the Republican candidates, 165 electors. From the four States of Florida, Louisiana, South Carolina, and Oregon came duplicate sets of electoral votes certified by conflicting State authorities. Twenty votes were thus in doubt, of which the Democrats needed but one to elect and the Republicans needed all. Who was to pass upon their validity? The Constitution of the United States was ambiguous upon this point. Civil war seemed possible, but patriotism rose above party interests; Congress passed an emergency measure for a special Electoral Commission to decide the controversy, and President Grant approved it, January 29, 1877. The Commission, by a vote of 8 to 7, counted all of the 20 disputed votes for Hayes and Wheeler, who—since the Senate sustained the decision—became President and Vice-President. Democrats, while accepting the result, have always contended that Tilden and Hendricks were rightfully entitled to the Presidency and Vice-Presidency. Ten years after the Hayes-Tilden contest, Congress enacted the present regulations for counting the electoral vote. See UNITED STATES HISTORY; HAYES; TILDEN. Consult Dougherty's *The Electoral System*.

Electoral Reform, any improvement by law or custom in the process of conducting elections to public office. This term can be applied to the movement of the last 100 years for the purification of elections in the United States and Great Britain.

Electors, in the German Empire, were those great princes who had the right of electing the emperor or king from the 13th to the beginning of the 19th century. In the earliest times, under the Carolingians, the crown was hereditary; afterwards Germany became formally an elective monarchy, but the election was practically limited to the reigning family. In the 13th century the right of election, for a time exercised by all the princes of the empire, became limited to seven holders of the highest ecclesiastical and civil offices. The electors held a commanding position in the German Empire. They had many important rights, exemptions and privileges, and royal dignity. Their powers came to an end in 1806, when the Empire was dissolved, but the title continued in use until 1866. See Bryce's *Holy Roman Empire*.

Electra, in Greek story, the daughter of Agamemnon, king of Mycenæ and Argos, and of Clytæmnestra. After the murder of her

father by Clytæmnestra and Ægisthus, she saved her younger brother Orestes; and when he returned to Argos to punish the murderers of his father, she helped him to take vengeance on Clytæmnestra and on Ægisthus. After the vengeance was accomplished, Orestes gave her in marriage to his friend Pylades. Both Sophocles and Euripides have made her the chief character in the plays called by her name, and she also takes the leading part in the *Choëphori* of Æschylus. Her story is the theme of Richard Strauss' opera *Electra* (1909).

Electrical Engineers, American Institute of, a professional association of electrical engineers, founded in 1884 and incorporated in 1896. The objects of the Institute are the advancement of the theory and practice of electrical engineering and of the allied arts and sciences and the maintenance of a high professional standing among its members. There are three grades of memberships—Associate, Member, and Fellow—and a special class for enrolled students. Membership in the various grades depends largely on experience, with an age limit in each case. Three national conventions are held each year, and there are regional meetings under the supervision of geographical district officers. Local meetings are held monthly by sections and branches. A monthly *Journal* is issued, and annual *Transactions*. Headquarters are located in New York City.

Electrical Machinery. Electric machines are described in detail in the articles on DYNAMO AND MOTOR and ELECTROSTATIC MACHINES. The present article has to do with their applications in industry. The ideal method of driving a factory is to supply each machine with its appropriate motor, but there are conditions in service where the group drive can be used economically. The choice will depend upon the manufacturing requirements, the types and positions of the machines, and the company's resources. The type of motor to be used depends upon (a) the source of supply, whether d. c. (direct current) or a. c. (alternating current); and (b) on the work which is required of the motor.

D. C. Motor Types.—For d. c. service the protected or enclosed multipolar motor is most frequently used. For special service these machines may be totally enclosed, and are both water and acid proof. They require little attention and their cost of upkeep is small. Motors of the shunt-wound type are used when a constant-speed drive at all loads is required. These are especially desirable for group drive, since they insure a constant drive for each

machine regardless of the total load on the motor. When, however, the demand upon the driving motor is intermittent, or the motor starting-and-stopping requirements are frequent, the compound motor is usually employed. This motor exerts an increasing torque under increasing load, with corresponding reduction in speed. It is largely used to drive metal working machines having a high load point in the operating cycle, as shearing and punching machines, etc. The speed of a shunt or compound-wound motor may be varied by introducing resistance into the shunt-field circuit. A 33 per cent. increase in speed may thus be obtained with the ordinary shunt motor, while for special designs a 4 to 1 variation in speed is possible. The individual electric drive has the advantage of wide speed control, and small variations of speed can be easily effected. A considerable reduction in speed is usually carried out by a worm and spur wheel, while moderate reductions in speed are obtained by means of a simple spur gearing or silent chain drive. This last method does not produce the noise of the ordinary gear drive, and load shocks are not so readily transmitted to the motor. The heavy current drawn on starting motors, especially the shunt type, is apt to generate enough heat to damage insulation; so that it is necessary to limit the current by inserting temporary resistance, to be cut out as the speed rises. If the motor speed is to be regulated by the field current, the field circuit must have its own rheostat. The armature may have a reversing switch for reversing the motor. All these controls must be operated only at the proper time, or disaster follows. Therefore it is best to have but one controller for a given machine, and to combine here all the necessary functions for a given case.

The starting device should have a no-voltage release coil and a maximum load cut-off, or circuit-breaker, the switch contact acting independently of the handle. When this is used, the risk of overheating or burning out an armature is entirely obviated, even in careless or clumsy hands, and the additional cost is entirely offset by the security afforded. The overload breaker also affords protection to the machinery, for if there is any load the current instantly rises, actuates the circuit breaker, and the motor stops, whereas with the ordinary shafting with unit motor drive the power continues to be transmitted until the belt breaks or is thrown off. For most purposes one type of starting switch fulfills all requirements for the ordinary d. c. motors, a small

modification being made for series motors. With series motors, the starting switches have to be modified, as there is no shunt field. Both overload and no-voltage releases must be on the same current supply. In case the load suddenly drops on a series motor, the speed mounts dangerously, so that the no-current release should act as soon as the current is reduced to a certain amount.

A. C. Motor Types.—When the supply is a. c., it is common practice to use induction or synchronous motor types. Both of these are essentially constant-speed machines. There are two different types of *induction motors*; the squirrel-cage and the phase-wound type. The *squirrel-cage* type is used for constant-speed service when starting requirements are infrequent. It has a relatively small starting torque and draws a large starting current from the line, but a large starting torque and rapid acceleration on starting may be obtained, when the smaller motors are used, by increasing the rotor resistance. The *squirrel-cage induction* motor is especially applicable in shops or mills where dust, dirt, and acid fumes are prevalent, as in wood-working, cement, and chemical plants. The motors used for saw-drive are often covered with sawdust, which would involve considerable fire hazard if the usual type of direct current motor was used. The induction motor has also a special application in the paper and shoe industries, because of the constant-speed requirements. The *phase-wound* type of induction motor is used when the service is such as to demand (a) a moderate starting current being drawn from the line and (b) large starting torque. This type of motor admits of using a variable resistance in the rotor circuit to make a fairly wide speed range possible. When the work to be done requires two or three motor speeds, multi-speed induction motors are frequently used, the different synchronous speeds being obtained by changing the number of poles in the magnetic circuit.

Induction motor starting devices sometimes employ auto-transformers to step down the voltage impressed on the motor at stand-still. To start the motor, the primary (stator) is connected to taps on the autotransformer which gives a voltage of from $\frac{1}{2}$ to $\frac{2}{3}$ the rated voltage for the small motor and $\frac{1}{3}$ to $\frac{1}{2}$ in the case of large motors. The phase-wound rotor induction motor may be operated at reduced speed by inserting resistance in the rotor circuit. This procedure, however, lowers the efficiency proportional to the reduction in speed, as energy is wasted in the resistor. If

this energy can be supplied to another motor (usually of a polyphase commutator type) to drive either the same or another load, the overall efficiency may be improved and speed control obtained. With large motors various schemes are utilized to control speed and sometimes power-factor by means of such auxiliary machines. Sometimes these are on the same shaft and in small sizes may be built practically as one machine. They are usually arranged for driving both above and below synchronous speed, in order to keep the auxiliary apparatus as small as possible for the required speed range.

Synchronous motors may be either single or polyphase. The starting of the single-phase type may be accomplished by an auxiliary motor. The synchronous motor is employed where absolute constancy of speed under all conditions is required, as in the drive of textile machinery and silk looms, where speed variation might cause a defect in the finished product. Synchronous motors are often applied where it is desirable or necessary to control the power factor of the circuit. They may be used to modify the power factor at the load end of long transmission lines and in this way hold the load voltage constant. When used in this manner they are not designed to carry mechanical loads. The single-phase series motor has a very powerful starting torque, high power factor, and relatively high efficiency, and is most generally used for traction work. The speed is controlled by varying the voltage impressed on the motor, which is usually done by means of an autotransformer, with a number of taps. A. c. motors are usually protected by relays, of the overload and low-voltage release type.

Comparison of D. C. and A. C. Types.—The rapid extension of alternating-current systems, due to the greater advantages of alternating-current transmission, has caused a very general use of A. c. motors and this load forms a large part of the power load of the modern central station. A. c. motors are inherently more rugged and durable than the d. c. motors. As most A. c. motors are polyphase, a greater number of wires to a motor is required, but this slight disadvantage is more than compensated by the increased efficiency possible through A. c. polyphase transmission. A. c. motors compare favorably with d. c. motor types when used for similar conditions of drive. Thus the A. c. series motor, although having a slightly lower electrical efficiency, in all other respects compares favorably with the d. c. series motor for traction and crane serv-

ice, where the motor is frequently started and stopped under heavy load. The induction and synchronous motor types compare well with the d. c. shunt motor and for some applications may be superior. Modern high-speed elevators are, as a rule, driven by direct-current motors. This direct current is frequently furnished by motor-generator sets with field control on the d. c. generator for the major portion of the speed control of the motor raising or lowering of the elevator cage. This permits very smooth operation economically.

Electric cranes and capstans are now in extensive use with d. c. and A. c. motors. The series d. c. motor is especially adapted to this work, while the phase-wound induction motor is used where only A. c. supply is available. Electric travelling cranes, made up of a bridge moving longitudinally on overhead tracks, a trolley moving transversely on the bridge, and the hoist, usually have three motors—one for driving the structure itself and one for each of the other elements mentioned. Automatic brakes are used to sustain the load when lifting and to regulate the speed when lowering, the hoist motor usually having to drive the load down. Very large motors (8,000 to 10,000 H.P.) are used in the steel industry. When the motor must be reversed d. c. motors are used. In this case, the d. c. is usually furnished by a motor-generator set for each large motor, utilizing field control of the generator largely to control the speed of the motor and permit very rapid reversal. The number of ships equipped with electric drive is rapidly increasing, speed control and arrangement of apparatus being primary reasons for electric drive. The size of motors varies according to the size of the ship. In battle cruisers eight 25,000 H.P. induction motors are used to drive the propellers. Speed control is provided by pole changing on the motors and change of frequency of the supply by change of turbine speed. Another recent application of electric motors is in the oil fields, where induction motors are being used successfully for drilling, pumping, and cleaning oil wells.

Electrical Potential.—To describe and explain the movement of electricity, the terms 'electrical potential' and 'difference of electrical potential' are used. Thus if we join two electrical conductors (*a*) and (*b*), by a wire and find that there is a flow of electricity from (*a*) to (*b*), we ascribe the flow as being due to a difference of electrical potential between the two conducting bodies, and say that there is a flow of current from (*a*) to (*b*) because (*a*) is at 'the higher potential' and

(*b*) at 'the lower potential.' In the case of electro-static charges, however, this flow or current is only momentary, because the two bodies in an instant reach the same 'potential.' By means of electrical cells and generators, it is possible to maintain a continuous difference of potential and hence a continuous electric flow or current between two points of an electrical conducting system. The electrical potential of the earth is taken as zero. Since the earth is a conductor, all points on it are at the same potential, otherwise there would be a flow of electric current until equilibrium was reached, *i.e.*, the 'potential difference' would be zero. A body (*a*) is considered to have a positive electrical potential when positive electricity tends to flow from it (*a*) to the earth; and in the same way, a body (*b*) is at a negative electrical potential when positive electricity tends to flow from the earth to the body (*b*). Thus, when the potential of a body is mentioned, it is understood to mean the difference of potential which exists between the body and the earth, the earth being taken as the zero of reference to which the electrical conditions of all other bodies are referred.

It is to be noted that the convention adopted above, regarding electrical current as a flow of positive charges from a point of positive potential to a point of negative potential, is not in agreement with the more modern conception, which considers the current as being a flow or a movement of negatively charged particles (electrons) from a point of negative potential to a point of positive potential. The practical unit of potential and 'potential difference' is the international volt, which is the difference of potential that, steadily applied to a conductor whose resistance is one international ohm, will produce a current of one international ampere. The standard cadmium cell is considered the practical standard source, the potential difference of which represents a definite fraction of an international volt.

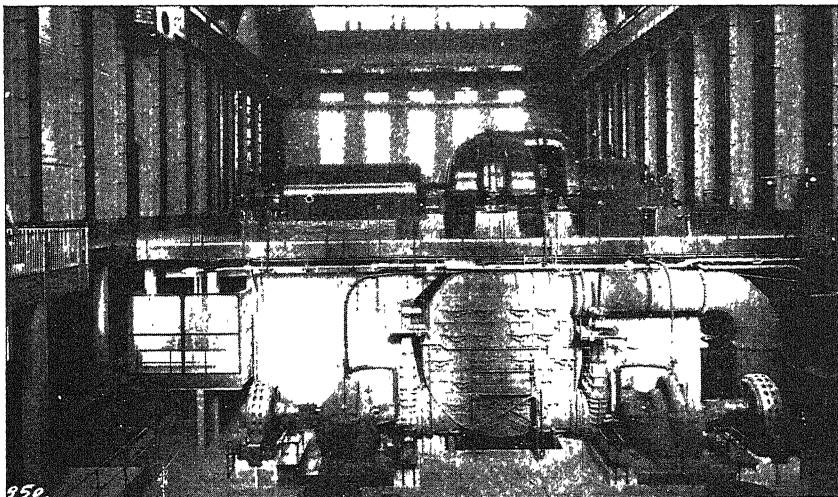
Electrical Supply. Since the first central supply for electrical energy started operation in 1883, the growth of the stations, systems, and utilization of electrical energy has been phenomenal. Formerly the principal use of electricity was for lighting; now the energy devoted to other uses has far surpassed the lighting requirements. Energy from single systems is distributed for traction power, electric heaters and furnaces, and electro-chemical processes, as well as for lighting and other domestic uses. When the area to be served was small, say not over two miles square, and the

requirements not large, direct current was generated. With increased demands for energy and the greater efficiency of large prime movers, alternating current has superseded direct current for primary generation. In those cases where direct current is required, it is obtained from converting apparatus in substations supplied with alternating current or from private, isolated plants.

Steam Stations: Site.—Inasmuch as power is produced more efficiently in large units, it is more economical to serve large areas from a single station. Both the large units and the large area for distribution require alternating current. Further, with a large area served and

side of the building proper—in some cases at a considerable distance—is a space for fuel storage. A large portion of the switching equipment may also be out of doors. This is more generally true when the energy is transmitted at high voltages.

Boiler Plant.—Boilers are usually of the water-tube type to meet the requirements of modern stations. High economy is obtained by using feed-water heaters, air preheaters, economizers, automatic draft control and water-tube type of boiler walls, with resultant decrease in furnace size to produce a given amount of steam per hour. The furnace is provided with automatic stokers, usually mo-



Richmond Station, Philadelphia Electric Co., showing 50,000 kw. Turbo-generator, with 70,000 sq. ft. Condenser.

the convenience of higher voltages for distributing, the site of the station depends not so much on the load center as on the availability of large quantities of water for condensing purposes.

Buildings.—Most central stations are divided into three major parts which may be in separate buildings but are usually in one building with separating walls. The first section, the boiler room, contains the necessary equipment for converting the energy from the fuel into steam. The second section, the turbine or generating room, contains the turbine, generator, condenser, etc., for converting the energy in the steam to electrical energy. The third section, the electrical switching section, contains the buses and equipment for protecting and controlling the various circuits. Out-

tor-driven, type being the selected for the particular fuel available. The boiler in a modern power plant cannot be considered without reference to the turbine, as the boiler pressure is fixed by the turbine. The feed water is usually heated with steam bled from the turbine. For heat cycles requiring the reheating of steam between stages, the boiler must be especially adapted. The possibility of further power plant economy by the use of binary cycles has been proved with the mercury-vapor cycle.

Turbine Room.—In modern stations alternators are driven by horizontal turbines, the size depending on the character of the load demand and interconnections with other stations. The turbine may be single-barrel, for units up to 60,000 kw.; compound turbines

me used for capacities from 50,000 kw. up to the maximum size, at present 200,000 kw. Common steam pressures range from 250 to 400 pounds to the square inch for non-reheating cycles. For turbines arranged for reheating between stages, steam pressures of 600 to 700 pounds per square inch are used for the initial pressure. Although turbines and boilers with pressures of 1,200 pounds and higher are being installed in commercial stations, they have not been sufficiently tried out to be assured of a future. The alternators are of the rotating-field, stationary-armature type, directly connected to the turbines. Because of the high speed desirable for the turbine, the alternator has a small number of poles (2 to 5). The field is supplied through slip rings from the D.C. exciter. The large alternator is usually wound for a voltage between 13,000 and 14,000. Where higher voltage is desired for the bus, transformers are installed to step up the voltage. In spite of the high alternator efficiency, the heat due to the losses is very great. The approved method is to force air through special ducts in the alternator. On the main shaft of many turbine units an auxiliary generator is attached for furnishing energy to supply motors which in turn drive the exciter, pumps, fans, stokers, and other auxiliaries necessary for the operation of the unit. This scheme provides an economical and reliable supply for auxiliaries.

Switchboard; Bus Structure; Switch Gear.—The modern switchboard contains the apparatus for controlling the various generator, bus, and feeder switches, signalling apparatus, and protective and metering equipment. Because of the high voltage involved, usually 11,000 or 13,200 volts, the switches proper are placed at a distance from the board, usually in separate fireproof compartments, and their operation is actuated by remote control, either mechanical or electrical. The switches operate with their contact jaws in oil, to suppress the arc occurring when the circuit is ruptured, and, particularly, when the switches open on account of overload—*i.e.*, a short circuit—in which case the energy dissipated in the switch may be very great. The position of the different switches, whether open or closed, is indicated by different colored lights located on the operating board. Because of the large amount of energy and the high voltage involved, bus bars are no longer placed on the operating switchboard, proper, but are located in brick or concrete compartments, some distance away.

Control of Alternators.—The entire control

of the main generators is obtained from a benchboard, which may be placed in a gallery overlooking the generating room. The control switches for each generator, which include excitation, load-distribution, and signalling operations, are mounted on individual panels. The performance of each generator is thus clearly indicated and controlled. The electrical, remote switch-control system is provided rather than the mechanical system on account of the distance between the control board and the different plant generating units.

Protection to Electrical Service and Equipment.—The occurrence of a short circuit at any point in a system supplied by a high-capacity central station is a more or less serious matter, depending on the location of trouble relative to the power house. A short circuit close to the station may cause an abnormal current flow of ten to twenty times the normal full-load rated current of the station, producing mechanical stresses in generators, bus bars, and feeders, which will generally result in serious deformation, unless the cause is quickly removed and the current reduced. The temperature in machines and wires is also raised beyond the design limits in case of short circuit. To reduce the maximum possible current under these conditions, choke coils are inserted in the generator leads, and also in the feeders. To clear the trouble when a short circuit develops, overload relays supplied by current transformers are provided. These relays are energized if the current in the feeder rises to an excessive value, and function so as to trip the switch connecting that particular feeder to the bus. By the use of these devices, only the feeder in trouble is disconnected, while service to the remaining feeders is not affected. Generators are provided with reverse energy relays and differential relays which function so as to prevent a flow of current into the generator from the bus in case of trouble in the machine itself.

Operation.—Arrangements are always provided for running the alternators in parallel, *i.e.*, for connecting them to a common bus, so as to enable each machine to contribute its share of load, as demanded, to the transmission system, and hence to the load. The number of alternators in use depends on the demand for current; more machines being thrown into circuit as the demand increases. The introduction of a new machine, or its paralleling with the others, is, however, an operation requiring some care, and special apparatus is provided for ascertaining the precise moment at which the switches of the in-

coming machine should be closed. The amount of power contributed by each alternator is controlled by proper steam throttling of the turbine prime mover, arrangements being provided for adjusting the governors while running from the control panel. A system operator's board is usually employed for the convenient operation of an A.C. central station, and on this the functioning of the complete system is indicated. The wiring is such as to indicate the position of all switches, *i.e.*, generator, bus, and feeder switches, identifications being secured by the use of colored lights. If the central station operates in parallel, or is 'tied up' with other generating stations, sometimes at a considerable distance, the tie-line connections are indicated.

Transformers.—In case the voltage generated is not sufficiently high to permit of efficient transmission to loads located at a distance, banks of step-up transformers are used, these transformers being located in fire-proof vaults or bays, remote from generators and switching apparatus. They are usually of the air-cooled type, oil-insulated, although in many cases a cooling coil with water flowing through it is provided to carry away the dissipated heat. The vaults are usually provided with a drain to permit ready removal of the oil in case of fire.

Hydro-electric Stations.—Much of the electrical apparatus previously described is used in a hydro-electric station, the main difference being in the prime movers, transformers, and switch gear. The water turbines driving generators derive their power from the flow of water under various heads (difference in level). They may be designed for high heads (2,100 ft.) as well as for low heads (30 ft.), and have been constructed in units, making it possible to deliver 70,000 H.P. High-head units are usually horizontal, while for medium and low heads the unit may be either vertical or horizontal, depending upon the particular plant conditions. Since the generator plant is at the water-power site, usually at a considerable distance from the load center, long transmission lines are required and corresponding high transmission voltages must be employed to secure a reasonable overall system efficiency. Voltages as high as 220,000 volts are used commercially. The transmission of voltages of this magnitude makes it necessary to provide greater bus spacing, and the insulation problem becomes difficult. Transformers require special design for these voltages, while protection against lightning demands very serious consideration in view

of the magnitude of the overhead system. Many small water powers are being developed by installing remote controlled or full automatic equipment.

Substations.—To link the transmission and distribution system of the electric-service company is the substation, whose function it is (1) to transform alternating current from one value of voltage to another, usually a lower one, or (2) to convert from alternating current to direct current or to another frequency. Any of these substations may be manually operated, remotely controlled, or entirely automatic.

Alternating Current Substations.—Transformer substations are used to step down voltage from that used for transmission to that used for primary distribution and again for supplying the secondary distribution circuit from the primary system. The former type of substation is used for systems supplying large cities, where the energy from the generating stations has been stepped up to 66,000 volts or over for transmission. The apparatus consists of high-tension oil switches, step-down transformers (reducing the voltage to 22,000 volts or sometimes 11,000 volts), low-tension oil switches, and high and low-tension bus structures, all mounted out-of-doors. In addition, in a small building is the control board with protective and metering equipment.

From the primary substation (or in smaller systems direct from the generating stations) feeders supply secondary substations, which in turn supply the feeders throughout the area. These secondary substations may supply energy at reduced voltage or as direct current or at another frequency.

The secondary substation, because of its location in a populated district, is frequently completely housed, although the transformers at least may advantageously be located out-of-doors and thus reduce building costs.

Street lighting (see ELECTRIC LIGHTING) is usually of the constant current type, the current being provided by constant current transformers in the substations. There are still installations where the constant current is passed through mercury arc rectifiers to produce direct current for certain types of street lights, as the magnetite arc.

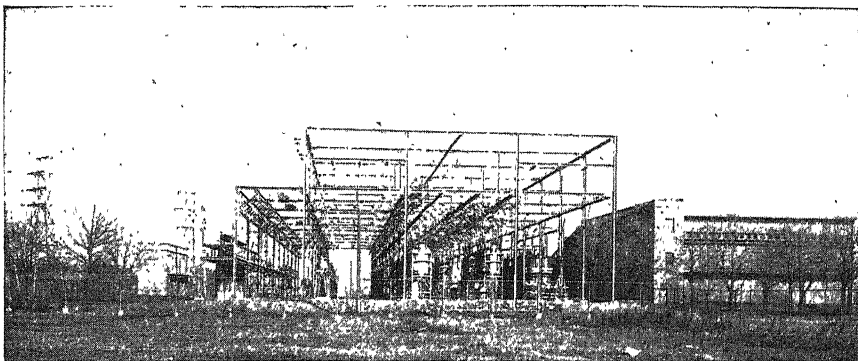
Frequency changer substations are required in certain cases, as (1) where 25-cycle supply is changed to 60 cycles for lighting, (2) in interconnecting systems of two frequencies, (3) for reducing frequency and providing single phase for railroad work.

Direct-Current Substations.—Direct-current substations are used to furnish energy for lighting and power in certain sections of many cities where the cost of change-over to alternating current is considered prohibitive. Railways for city and interurban service and for some main line electrification require direct current, which is supplied from railway substations. Either type of substation requires oil switches and control for the alternating-current supply, conversion apparatus, and buses with air circuit breakers for supplying the direct-current feeders, and metering and protective equipment. In addition, the substations for lighting and power frequently have storage batteries to insure continuity of service in case of failure of one or more units.

such that the line drop would reduce the consumer's voltage below normal.

Stations Generating Direct Current.—

Plants which generate and transmit as d.c. systems are usually isolated plants furnishing power to factories, or individual buildings. They may be of considerable capacity when supplying large industrial plants, such as steel mills, or foundries. In this case the plant capacity may be 50,000 kw. and the generating voltage 600 volts, a voltage which has proved best suited for this service. Country residences, when remote from a service of electrical supply, have in many cases a small plant to furnish light and power, gas or light oil engines being the prime movers used. Where possible, water is used as a source of power.



The 60,000 Volt (outdoor) and 12,000 Volt (indoor) Switching Stations at Echota, Niagara Falls Power Co.

The conversion equipment may consist of (1) rotary converters, (2) motor-generator sets, or (3) mercury arc rectifiers, or any combination thereof. The rotary converter has the elements of a synchronous motor and a direct-current generator combined in a single field structure with a single armature winding (see DYNAMO AND MOTOR: *Motors*). This requires transformers to stepdown the voltage to a particular value to give the desired d.c. voltage; with these same transformers the alternating-current supply is commonly transformed to six-phase because of the higher efficiency of the six-phase converter. The bus voltage for lighting systems is usually 240, with a neutral to give 120 volts to either bus, supplied either by the rotary converter transformers or by a storage battery. For certain systems two auxiliary buses are used giving 245 and 250 volts. The feeders are connected to the higher voltage buses when the load is

The prime movers employed in d.c. stations are usually steam, gas, or oil engines. Oil and gas engines are common in the smaller and more isolated plants, where the constant attention required by an ordinary steam plant may not be available. Many of the large industrial plants produce gas as a by-product, making this the most economical source of energy. This is exemplified in the steel industry, where large quantities of blast furnace gas are released.

The d.c. generators are usually compound wound, self-excited, and of the multi-polar types, because of their economy in material. The switchboard fulfils the same functions as described for the a.c. central station board, namely the interconnection, control, protection, and metering of the different circuits. On account of the low voltage involved, however, the buses and switches are usually mounted direct on the board. Protection to

different circuits and equipment is obtained by fuses, when the capacity is small. For large machines or supply mains, circuit breakers are universally employed.

In smaller plants, particularly the small isolated plant supplying light and power to a house, the storage battery finds its greatest use. When the connected load is light, the battery makes it possible to shut down engines and generators. The battery also aids in maintaining a steady voltage and load on the generators. It requires some special apparatus if it is to function properly.

Interconnected Systems.—As individual systems have grown, giving greater operating economy due to larger units, and greater capital economy due to the diversity of consumers' loads, so are similar and other economies gained by interconnecting one system with another and that with the next and so on. With interconnections it is possible for one system to supply another in emergency, to permit the more economical steam plant to supply more load and the less efficient plant to be held practically in reserve, to utilize hydro-electric plants to the fullest extent when the water is available, etc.

References.—Consult F. G. Baum's *Atlas of U. S. A. Electric Power Industry* (1923); *Transactions of the World Power Conference* (4 vols., 1924).

Electrical Units. See **Units.**

Electric Arc. See **Electric Lamps.**

Electric Battery, or Storage Battery.

When an electric battery is discharged, there occur chemical changes in the liquids and electrodes, caused by the passage of the currents through the cell. In some forms of cell all the products of the change remain in the cell, and in contact with the electrodes, in such a manner that the passage of a current in the reverse direction will produce the reverse action and restore the original conditions. Such a battery acts as a reservoir or accumulator of electric energy; for after each discharge, electric energy is again stored in it by driving a reverse current through it from some other source of electric energy.

Though many forms of battery allow a reversal, few of them are satisfactory. The simple collection of oxygen and hydrogen at the poles is impracticable, since they pass off as gases, and the only batteries that have proved successful are (1) the acid lead type, and (2) the alkaline nickel-iron type of Edison.

Theory of the Lead Cell.—In the first batteries, devised by Planté, a lead plate covered

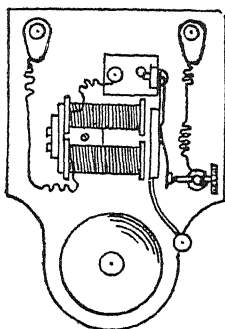
with spongy lead formed the negative electrode, and a plate covered with a layer of lead peroxide formed the positive electrode; these were immersed in sulphuric acid and water. On discharging these batteries the lead is converted into sulphate of lead, and the hydrogen conveyed to the positive plate is oxidized by the peroxide of lead. The lower oxide thus formed is attacked by the acid, so that sulphate of lead is produced on both plates, and a part of the acid is removed from the liquid. On reversing the current, hydrogen is carried to the negative plate, and reduces the sulphate of lead back to metallic lead, while the oxygen converts the sulphate on the positive plate to peroxide; and the sulphate in both cases returns to the liquid as sulphuric acid.

Arrangement of Lead Cell.—A lead cell contains two groups of plates, positive and negative, arranged alternately. If the positive and negative plates of a battery touch, it is short-circuited and so discharges itself. To prevent the plates from coming in contact with each other, insulating separators of some kind are generally employed, usually thin sheets of wood. These wooden separators are treated chemically to remove all injurious substances, and are grooved vertically to allow gases to escape and electrolyte to circulate freely. Thin hard-rubber sheets, perforated with small holes, or made with imbedded threads, are also used. The separator must be very porous, so that acid may readily diffuse through it, otherwise the resistance of the battery is increased; at the same time it must prevent particles of solid material from bridging across from one plate to another and so short-circuiting the cell. The acid is specially prepared, free from metals, with a density of 1.15 to 1.30 depending upon the type of service. If it is too strong, the lead and separators are slowly attacked; if too weak, the resistance of the cell, and hence the drop in voltage when current is drawn, is increased.

Theory of the Edison Cell.—In this form of electric cell, the negative plate is a nickel-plated steel grid into which are pressed steel pockets packed with iron oxide bearing a little mercury; while the positive plate is a nickel-plated grid to which are fastened perforated nickelled steel tubes filled with alternate layers of nickel hydrate and thin nickel flakes. These plates are arranged alternately, there being one more negative than positive, and all the like plates in a cell are bolted to one steel terminal. The nested set is placed

in a nickel-plated steel jar, which then has its top welded on. The electrolyte is a 21-per-cent. solution of potassium hydrate plus a little lithium hydrate. The first charge changes the nickel hydrate to oxide and the iron oxide to metallic form. With every cycle of use thereafter, on discharge the iron becomes oxidized, and the nickel oxide goes from a higher to a lower form; while on charge, metallic iron and high oxide of nickel are produced. See CELL, VOLTAIC; Planté's Storage of Electrical Energy.

Electric Bells and Alarms. *The Vibrating Bell.*—The ordinary vibrating bell is shown in Figs. 1 and 2. In the diagram (Fig. 2) T and T' are terminals to which wires from the battery are attached. $M C$ are two magnetizing coils wound around soft iron cores; F is a platinum stud fastened to the

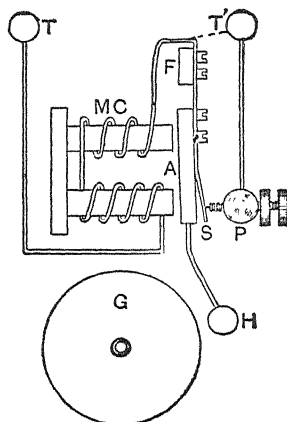


Vibrating Bell. Fig. 1.

spring S , which is in turn attached to the soft-iron armature A ; P is a platinum-pointed screw in contact with S ; H is the hammer, and G is the gong. The current enters (say) at the terminal T , passes around the coils $M C$, and is led to F . Thence it flows down the spring S to the platinum point P , whence it is conducted to T' , and so back to the battery. As soon as the current is switched on, the soft iron cores within the coils $M C$ become magnetized, and attract the armature A . The hammer H is thus pulled up, and strikes the gong G a smart tap. But when A is pulled up to the magnets, the spring S breaks contact with the platinum point P , the circuit is broken, the cores lose their magnetism, and A falls back again, taking the hammer with it, and bringing S once more into contact with P . This completes the circuit again; the cores in $M C$ are remagnetized, A is again attracted, and H again smites the gong. Thus, as long as the circuit is closed the armature is alter-

nately attracted to the cores and falling back again.

The Single-stroke Bell.—The single-stroke bell is similar in principle to the vibrating bell, and differs in construction only in one small detail. After passing round the magnetizing coils $M C$, the current is led direct



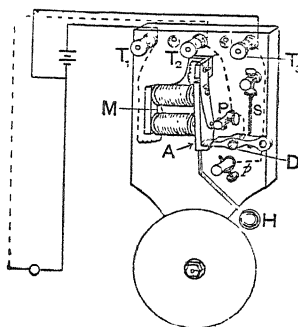
Vibrating Bell. Fig. 2.

to the terminal T' by a wire indicated by the dotted line in the diagram (Fig. 2). When the circuit is made, the cores are magnetized, the armature A is attracted, and the hammer strikes the gong one tap. But there is now no break in the circuit. The armature, therefore, remains adhering to the electro-magnets, and no more strokes are struck. To get a clear stroke, the armature should meet the magnet poles while the hammer is still a little short of the gong. In the trembling bell the hammer should strike the gong without the armature touching the poles.

Continuous-Ringing Bell.—In the case of burglar and fire alarms, and for some other purposes, it is desirable that the bell should continue ringing until attention is attracted. To accomplish this, a simple device is employed. The continuous-ringing or continuous-action bell (Fig. 3) has three terminals, T_1 , T_2 , and T_3 . The armature is somewhat longer than in the vibrating bell, and at its lower extremity carries a catch which engages with the trigger D . When the current passes in the usual way through T_1 , and T_2 , the armature A is attracted and frees the trigger. The spiral spring S pulls up the end D of the trigger, and the other end falls down on the contact point P , which is connected to T_3 . This cuts out T_2 , but the bell goes on ringing

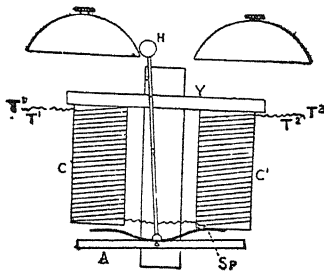
through T_1 to T_3 until the trigger is restored by hand to its normal position.

The Magneto Bell—The current required to ring the magneto bell (Fig. 4) so exten-



Continuous-Ringing Bell. Fig. 3.

sively used in telephone work is derived not from batteries, but from a magneto generator. On turning a handle, a coil of fine wire wound on an iron core is rotated rapidly in a strong magnetic field. Alternating currents, changing their direction with great frequency, are generated in the wire (see ELECTRICITY,



Magneto Bell. Fig. 4.

CURRENT), the ends of which are put into electric communication with the terminals T_1 and T_2 of the bell shown in the diagram, which exhibits the bell and its connections only. Two coils, c and c' , are joined by a yoke-piece y . An armature A , pivoted on a spring sp , and carrying a hammer H , opposes the poles of the cores. An ordinary horse-shoe magnet, placed with its poles N . and S . as shown, magnetizes the armature so that the ends are S . poles. The alternating current from the generator is sent round the coils, each pole of which becomes alternately a strong N . pole, and attracts the opposing S . pole of the armature. Thus the armature

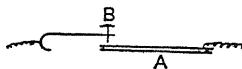
swings in see-saw fashion between the poles, and with each swing the hammer strikes one of the gongs.

Burglar Alarms—Fig. 5. shows in section an excellent type of burglar alarm. The brass plate B has a small circular hole cut in it, and bears on its back a contact spring s , and a metal-topped, hard-rubber block E . From the contact spring and metal top of E , respec-



Burglar Alarm. Fig. 5.

tively, wires pass to bell and battery, which are placed at any convenient point in the circuit. When the spring makes contact with the top of block, the circuit is closed and the bell rings. A marble, M , is placed between the spring and the plate so as to project slightly through the hole, while the spring, bearing on the top of the ebonite block, holds it in position. The whole is sunk level with the wood-work in the groove of the window-sash, and near the bottom, the wires being below the woodwork. On closing the window, the marble is thrust back, and the contact spring forced off the top of the block. The alarm is now 'set.' Should the window-sash then be raised, the spring will force the marble forward, fall on the metal top of the ebonite block, and so complete the circuit and ring the bell.



Fire Alarms and Thermostats.

Fig. 6.

Automatic Fire Alarms and Thermostats.—Many types of automatic fire alarms have been devised. Almost all of them depend for their efficiency on the fact that heat causes most substances to expand. In one form the principle of the common mercury thermometer is adopted. A platinum wire is fused through the glass into the bulb, so as to make

contact with the mercury there. Another platinum wire is fused into the tube at some distance above the point at which the mercury stands at normal temperatures. These wires are connected to the bell circuit. Should the temperature rise considerably, the mercury ascends in the tube till at length it makes contact with the upper wire, and so completes the circuit and sounds the alarm. Another type depends upon the fact that the coefficient of expansion varies for different metals. Strips of two dissimilar metals are soldered together to form the rod A, and placed on a stand, with the metal that expands least on top (Fig. 6). On the same stand the screw B is fixed and adjusted so that its point just fails to touch the metal rod A, which at that end is free, but at its other extremity is fixed. On the application of heat, the bar warps and makes contact with the screw, thus ringing the bell.

Electric Control of Clocks.—The time registered by a standard clock is simultaneously indicated at a number of distant places by the following means:—The standard timekeeper is supplied with an apparatus whereby it automatically completes an electric circuit at regular stated intervals, generally every half minute. Connected with the circuit so completed are a number of dials at the distant places. Behind the face of each dial is an electro-magnet. At each 'make' the electro-magnet attracts an armature which is connected with a ratchet wheel. This allows the ratchet wheel to slip forward one tooth, and thus at each periodical interval the hands are moved forward to correspond with those of the standard clock.

Bibliography.—Consult Vol. 1 of *Electric Lighting and Power Distribution*, by Perren Maycock, containing an excellent section, profusely illustrated, on bells, bell circuit, alarms, indicators, etc.; *Electric Bells* (4th ed. 1862), by Bottone, simple and practical for amateurs; also Powell's *Electric Bells and Alarms*.

Electric Cables and Conductors. Electric cables may be regarded as the pipes or channels along which electric current flows. The volume of electric current that will flow through a cable with a given electrical pressure is strictly proportional to the area of the cross section of conducting material of which the cable is constructed.

Some materials permit of the easy passage of electricity, and are called conductors. Such are all metals, silver and copper heading the list. Carbon is inferior, and liquids of the

nature of acids, alkalis, and solutions of chemical salts conduct with much less freedom. Other materials almost entirely prevent the passage of electricity, and are called non-conductors or insulators (see *ELECTRIC INSULATORS*).

Cables may be classified as those used for interior work in the wiring of buildings, and those laid along streets or through country for distribution from a central station. The latter may again be divided into underground cables and overhead cables. In some cases, however, the same type of cable is used for different purposes. Submarine cables are discussed under the heading *TELEGRAPHY*.

Underground Cables.—The methods of protection adopted in underground cables are: armoring with steel tape; iron pipes; iron troughs filled in with molten pitch and covered with iron lids or concrete; earthenware pipes; concrete or cement pipes. All of these are used indifferently. In most cases lead-covering is adopted, since it is difficult to exclude moisture from a set of underground pipes; but where the trough is filled in with pitch there is no fear of moisture penetrating. A well-laid system of wrought-iron pipes hardly requires lead-covered cable for short lengths; but all the earthenware and cement pipes are liable to damp.

Manholes and Junction Boxes.—Since cables cannot be supplied in unlimited length on account of the weight, it is necessary to join them together, and also to make branches. This may be done by stripping the ends, twisting the strands together, and soldering the junction. The insulation is then replaced as perfectly as possible. For indoor work in dry places it is sufficient to wrap the joint with layers of pure rubber tape, cemented together with india-rubber dissolved in benzene, and covered with cotton tape. But under ground the damp quickly destroys the raw rubber, and it is necessary to vulcanize it after it is put on. If carefully done, this makes the joint as good as the rest of the cable; and the method is largely used for tapping off small cables for the supply of houses, which are usually led off through an iron pipe into the house. Large cables cannot be treated in this way satisfactorily, especially when armored, and the method does not permit of the disconnecting or examination of the cable. For this purpose junction boxes are used. This is a favorite method for feeding points, as the feeders are brought into the box and the cables of the network pass out to the various streets. By removal

of the cover each cable can be tested, or disconnected if faulty.

Pits of brickwork or concrete are used, the pipes passing in at the sides, and the bottom being well drained. Lead-covered cables are always protected at joints in manholes by a water-tight wiped-lead sleeve.

High-Pressure Cables.—For distribution in towns, the pressure between two cables or two parts of a multiple cable does not exceed 500 volts. But where long distances are involved, alternating currents at pressures of from 2,300 volts to as much as 65,000 volts are employed. The cables for very high pressures are sometimes put overhead (see below), but in urban districts this is undesirable. The insulation must for this purpose be considerably strengthened by increase of thickness and complete freedom from cracks or blow holes. All joints must be carefully protected by equivalent insulation; and in general their use is avoided as far as possible.

Overhead Cables.—Cables of the foregoing type are sometimes put overhead, but since the air is itself an insulator, there are only needed insulating supports for bare wires, and a very perfect insulation is obtained if the supports can be kept dry. The wire is usually of copper, but aluminium with steel core reinforcement is also successfully in use. The choice is largely a matter of the relative prices of the two metals. With equal bulk, the resistance of copper is about two-thirds that of aluminium; but as it is more than three times as heavy, an equivalent conductor of the lighter metal weighs about half that of copper.

See ELECTRICITY, DISTRIBUTION OF; ELECTRIC POWER TRANSMISSION. Consult Meyer's *Underground Transmission and Distribution* (1916); Russell's *The Theory of Electric Cables and Net works* (1920); Del Mar's *Electric Cables* (1924).

Electric Cars. See **Electric Traction.**

Electric Catfish. See **Catfish.**

Electric Cell. See **Cell, Voltaic.**

Electric Circuit. The electric circuit comprises the path or paths along which the current flows; and as no disappearance of current is possible, these paths must be closed paths, if a continuous circulation of electricity is to take place. The chief law of the circuit is Ohm's law, that the current in a circuit is strictly proportional to the electromotive force. Therefore, the ratio of E.M.F. to current in a particular circuit, or in a part of the circuit, has a definite value for that circuit or part thereof, and is called its resist-

ance. The resistance of a piece of wire, for example, depends on its length, its area of cross section, its material, and its temperature, but on nothing else. Its shape—whether strip, tube, or rod—its line—whether straight, coiled, or zigzag—makes no difference, nor does the quantity of electricity flowing in it, except in so far as the wire is heated thereby. The unit of resistance is the international ohm, and is the resistance through which one international volt will drive a current of one international ampere. See OHM'S LAW.

Specific Resistance.—Resistance varies enormously with different materials, the resistance of hard rubber being many billion times greater than that of copper, so that the resistivity of hard rubber may be considered practically infinite. For comparing the resistance of different materials a standard cube of one centimetre each way is taken, and the resistance in ohms of this cube between two opposite faces is called the specific resistance or resistivity of that material.

Effect of Temperature.—In all pure metals and most alloys the resistivity increases as the temperature rises. In a few alloys the effect is negligibly small. The resistivity of all other materials decreases as the temperature is increased.

Series and Parallel Resistances.—When the path consists of conductors joined in one line end to end, so that the whole current flows through each, the conductors are said to be arranged in series. By the second law, the E.M.F. equals the current \times sum of resistances, or the total resistance of the circuit equals the sum of the resistance of the parts. In calculating the total E.M.F., the resistance of the battery, dynamo, or other source of electric power must be included. The product of current into the resistances outside of the generator, or the 'external circuit,' gives the E.M.F., or difference of potential on the terminals of the generator. When the circuit branches into two or more paths, which again unite, the conducting branches are said to be in parallel or in multiple (Fig. 1). A common application of parallel resistances is seen in the *shunt*.

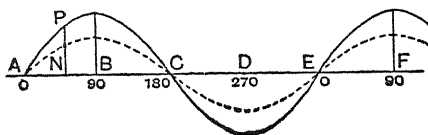
Resistance of Batteries (see CELL).—The passage of the current through a battery absorbs a definite portion of the total E.M.F., due to the resistance of the materials of the battery.

Combination of Batteries.—If a large E.M.F. is required, the cells are connected in series, with the positive terminal of one to

the negative terminal of the next, and so on.

Alternating Current Circuit.—When the current is variable in a circuit containing self-induction or capacity, the value of the current is modified. Therefore, with alternating currents, in which the value is perpetually varying, these effects may be very important.

The term alternating current usually implies a current due to an E.M.F. which periodically reverses its direction many times

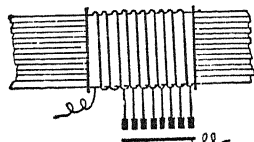


Alternating Current. Fig. 1.

in a second, at a uniform rate, and with a gradual change of value. This may be shown in a diagram by measuring time horizontally and E.M.F. vertically. Fig. 1 illustrates the usual character of the change, with rounded tops and smooth sides. If the E.M.F. is considered as produced by a rotating coil, one revolution would produce the change from A to E, and the curve repeat itself indefinitely. This distance is called one period, and the number of such periods in one second is called the frequency or periodicity. As A to E represents one revolution, the distance may be divided like a circle into degrees, and $AB = 90^\circ$, $AC = 180^\circ$, and so on. After E the circle begins again. In practice the curve is approximately a sine curve—i.e. the value of the ordinate PN is proportional to the sine of the angle represented by ON, with a positive maximum at 90° , zero at 180° , negative maximum at 270° , zero at 0° and 360° , when it repeats. Therefore the value may be written, Value of E.M.F. at any instant = maximum value \times sine of angle.

Measurement of Alternating Current.—It is obvious that a current with a maximum value of one ampere will not be so effective as a continuous current of one ampere. In measuring alternating current, a value is required so that one alternating ampere will heat a lamp to the same brightness as is done by one ampere of continuous current. The heating effect $= I^2R$, and is the same whatever the direction of the current. Hence a value is required such that when squared and multiplied by the resistance it will give the average heating effect; and this value will be the square root of the average value of the square of the current, or the root mean square—

R.M.S. If the R.M.S. of the current = 1 ampere, then that current will produce the same heating effect as one ampere continuous current. If the current is measured by the attraction of two coils of wire, through each of which the current flows, the attraction is proportional to the square of the current, and the average attraction, or pull of one coil on the other, is proportional to the mean square of the current. The square root of this pull is then a measure of the R.M.S. current, and the current will be said to have a value in amperes equivalent to the continuous current which gives the same pull. Alternating current ammeters are therefore graduated to read R.M.S. values of current. In the same way the R.M.S. E.M.F. is taken as the equivalent alternating E.M.F., and as electrostatic voltmeters (see ELECTROMETER) give readings dependent on the square root of the average square of the E.M.F., the reading on such instruments is taken as the equivalent E.M.F. Such values are also called effective amperes or volts.

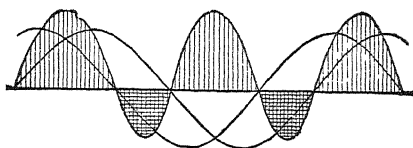


Choking Coil. Fig. 2.

Choking Coil.—This generally consists of a simple coil of wire with an iron core, made of wires or thin sheets (Fig. 2). If it were made solid, eddy currents would be induced in the core, which would heat it and cause waste of power. The choking effect, or impedance, may be varied by cutting out some of the coils, or by partially withdrawing the core. Again, by slipping a sheath of copper tube over the core, the currents induced in the sheath oppose the inductive action, and allow more current to pass in the main coil. Such an apparatus is used for dimming lights in a theatre, and is called a dimmer.

Power in Alternate Current Circuits.—In a non-inductive circuit, the power is given by R.M.S. current \times R.M.S. E.M.F., and will be given in watts. Hence power $= I^2R$, or E^2/R , or EI , as in a continuous current circuit, taking the R.M.S. values. But in an inductive circuit, the current and E.M.F. are not in the same phase, and at times are in opposite directions, showing that the induced E.M.F. is driving the current back into the dynamo, using the stored energy of the magnetized

coil (see **ELECTRICITY, CURRENT**). The net power given by the dynamo is the difference between these. In Fig 3 is shown $E M F$. and a lagging current, and the product at each instant gives the power at that instant, sometimes positive and sometimes negative. If a wattmeter is used in this circuit, the pull on the coils at each moment will be represented by the vertical height of the shaded power curve, and the average pull will be the difference of these areas. Consult Steinmetz' *Alternating Current Phenomena* (5th ed. 1916) and *Theory and Calculation of Electric Circuits* (1917); Lawrence's *Principles of Alternating Current* (1922)



Power in Alternate Current Circuits.

Fig. 3.

Electric Coherers. See **Electro-magnetic Waves**.

Electric Condensers. See **Condenser**.

Electric Conductors. See **Electric Cables and Conductors**.

Electric Eel (*Gymnotus*, or *Electrophorus*, *electricus*), a large South American fish, allied to the carps or suckers, although eel-like in form. It lives in the rivers of Brazil and Guiana and is the most powerful of the electric fishes, being capable of inflicting a severe electric shock. The electric organs, which occur in pairs on the back of the tail and on the anal fin, consist of numerous tiny cells supplied by large nerves passing from the spinal cord. See also **TORPEDO**.

Electric Elevators. See **Electrical Machinery; Elevators**.

Electric Eye. See **Electricity, Progress since 1934**.

Electric Fuses. See **Electric Lighting**.

Electric Generators. See **Dynamo and Motor**.

Electric Heaters. See **Electric Lighting**.

Electric Indicators. See **Electric Bells**.

Electric Insulators, substances through which electricity passes either not at all or with great difficulty. These include all transparent crystalline substances, dry organic bodies, oils, fats, gums, resins, and mineral silicates; also, all gases, except when much rarefied, strongly heated, or exposed to Roent-

gen rays. No metals, or aqueous, alcoholic, or ethereal solutions of salts are insulators, and some metallic oxides are excluded. Insulating substances show a great difference in insulating power.

The substances most used for insulating are: paraffin, hard rubber, vulcanite, flint glass, shellac, india rubber, gutta-percha, mica, porcelain and stoneware, vulcanized fibre, asbestos, bitumen, common glass, silk, cotton, dry wood, marble, slate, and various oils, gums, and resins generally used in mixtures. Except for this last group, the materials listed above stand in approximately the order of insulating power; but the property varies in different specimens and with the degree of dryness. Absorbent materials, as wood and cotton fibre, asbestos, and other porous mineral substances, are unreliable in damp places unless they have been saturated with paraffin-wax or shellac.

Insulators are used for the stands or bases of switchboards and other electrical apparatus, porcelain, marble, slate, and glass being most commonly employed. Mica is used for the insulating of commutators of dynamos and motors, and in places where the temperature is high and toughness is essential.

Consult Still's *Overhead Electric Power Transmission* (1913); Hemming's *Plastics and Molded Electrical Insulation* (1923); Del Mar's *Electric Cables* (1924).

Electricity, an agency producing an extensive group of magnetic, chemical and thermal phenomena.

The foundations of electrical science were laid about 1600 by Wm. Gilbert of Colchester, who, with the knowledge of the magnetic power of amber when rubbed quickly and of the lodestone, pointed out that glass and other substances could be made to exhibit similar phenomena, and coined the word *electric* (from the Greek of 'amber') to describe these substances. He also discovered that the earth acts as a magnet and has magnetic poles corresponding to the simple lodestone.

So varied are the aspects of electricity and so manifold its applications that they cannot profitably be discussed under a single heading. For the general principles and fundamental conceptions, see the articles on: **ELECTROSTATICS**; **ELECTRICITY, CURRENT**; **ELECTRIC CIRCUIT**; **ELECTROMAGNETIC WAVES**; **ELECTRICAL POTENTIAL**; **CONDUCTION**; **MAGNETISM**; **LIGHTNING**.

Electricity, Animal. Following Galvani's classic experiment with a frog's leg, the ex-

trema sensibility of the nerves to electric currents has led to the discovery that electric currents are involved in all muscular action. Certain fish—the Gymnotus or electric eel, the Malapterurus (see CATFISH), and the Torpedo have a special electric organ by which electric shocks can be given through the surrounding water. The organ appears to be modified muscle, columnar and laminated in structure, and controlled by a special set of nerves.

Electricity, Atmospheric. The atmosphere is generally at a different potential from that of the earth beneath, and in fine weather is positive, but during or after rain frequently negative. The difference of potential increases with the height above the ground, but less rapidly as the height increases. Near the ground, an average value of 100 to 150 volts per metre is usual and at considerable heights a large difference of potential is reached, which in thunderstorms becomes enormous. The causes of the difference of potential and its variations are obscure. It seems to be due partly to condensation of water vapor, partly to the influence of sunlight, more especially the ultra-violet part of the spectrum, for many bodies discharge electricity into the atmosphere under its influence.

Electricity, Current, or Electrokinetics, is the branch of electro-dynamics which treats of electricity in motion, as opposed to electricity in equilibrium, which forms the subject matter of ELECTROSTATICS. As is pointed out under the latter heading, what is conventionally called positive electricity flows, or tends to flow, from regions of higher to regions of lower potential (see also ELECTRICAL POTENTIAL). Thus potential in electricity is analogous to temperature in heat and to pressure in fluid motion. The word pressure is indeed very often used in the sense of potential.

It is not possible by means of charged conductors of the kind just described to get a steady flow of current, for as the charge diminishes, the potential falls off, generally with great rapidity. We may obtain a fairly continuous current by the continuous working of a Wimshurst or other influence machine; but because of the high potential differences involved, such a method is of little practical use. It was discovered by Volta, however, early in the 19th century, that it was possible to maintain a difference of potential at the ends of a conducting channel, and so obtain a continuous current.

The flow of a current, as we have just seen, necessarily involves a loss of energy. Consequently in the Volta arrangement there must be some source of energy which can be drawn upon. This source is chemical affinity.

The facts are easily stated, although the actions involved are still somewhat obscure. Thus when two different metals, say copper and zinc, are dipped simultaneously, but without touching each other, into dilute sulphuric acid, they form what is known as a voltaic cell. When tested by an electrometer of sufficient delicacy, they are found to be at different potentials, the copper being at a higher potential than the zinc. Consequently, when the ends not immersed are joined by a wire, a current is found to flow along the wire, and will continue to flow as long as the chemical composition of the liquid remains, broadly speaking, the same. This flow is accompanied by chemical action between the zinc and the acid, sulphate of zinc being produced and hydrogen set free. The same electrical flow is produced by many other combinations of metals and decomposable liquids, and in every case the flow is associated with chemical action and evolution of energy.

Magnetic Effect of Currents.—The presence of an electric current is recognized by one of its effects or properties, the most convenient being its magnetic property. The unit current, in terms of which all current quantities are to be expressed, is indeed defined fundamentally in terms of its magnetic effect. If the form of the material circuit along which the current flows remains unchanged, the strength of the current is defined as being proportional to the magnetic field established by it. The fundamental fact of the magnetic action of a current is usually expressed by saying that when a current is made to flow along a wire set parallel to a magnetic needle either above or below it, the needle is deflected from its original position through an angle whose magnitude indicates the strength of the current.

Electromotive Force and Current Strength.—Any variation of electromotive force in a given circuit is accompanied by a corresponding variation of current strength, and that according to a simple law, known as Ohm's law. In other words, the current along a given conductor is proportioned to the electromotive force acting along it. And generally for a complete circuit the current is proportional to the electromotive force acting round the circuit, or for the same circuit the ratio of the current strength to the E.M.F.

is a constant quantity. This quantity we call the 'conductance' of the circuit. It is the measure of its conducting power.

With a given battery as a source of E.M.F., we can vary the current strength by altering the conducting power of the circuit. It is in this way, indeed, or by a method based on this principle, that we compare the conductances of different conductors (see ELECTRIC TESTING). In a general way we increase conductance by offering greater facility for the flow of the current, as, for example, by widening the channel or shortening the path. Experiment shows that the conductance of a given length of a particular kind of wire is proportional to the cross section. If we double the area of section of the wire, we double, also, the conductance. With the same E.M.F. acting along the wire we shall get double the current. If, on the other hand, we double the length of wire, we find that the conductance is halved.

Conductance is defined as the ratio of the current strength to the E.M.F.; and its reciprocal, the resistance, is defined as the ratio of the E.M.F. to the current strength. Symbolically we may formulate Ohm's law in either of the forms—

$$I = KE, \text{ or } IR = E,$$

where K is the conductance and R the resistance (see also ELECTRIC CIRCUIT). The unit of E.M.F. being the volt, and the unit of current being the ampere, the unit of resistance defined by the equation just given is what is known as the ohm. Of all electrical measurements the comparison of resistances can be made with the highest degree of accuracy. After much refined experimenting, the standard ohm has been determined as equivalent to the resistance of a particular column of mercury of definite section; and practically the measurement of E.M.F. depends upon the assumption that this standard legal ohm is accurate. See UNITS.

Thermal Effect of Current: Joule's Law.—It has been pointed out above that the electrical energy lost per second, when the electro-motive force E drives the current I , is measured by the product EI . But since by Ohm's law $E = IR$, we find for the rate of loss of energy—i.e. for the rate of generation of heat—the quantity I^2R . Thus the heating effect of a current is as the square of the current strength and as the resistance of the conductor through which it is passing (Joule's law). The heat developed will raise the temperature of the conductor, the rise of temperature in any particular case depending

upon the amount of heat generated per second, the mass of the conductor, and the specific heat of the material forming the conductor.

Magneto-electricity and Induction of Currents: Faraday's and Lenz' Laws.—The fundamental facts of magneto-electricity were discovered experimentally by Faraday. We may, however, begin our discussion by referring to the theoretic aspect of the phenomena in relation to one simple case. Imagine a circular coil of wire suspended so as to have perfect freedom of motion about a vertical axis, and let the coil be hung with its plane parallel to the lines of force of a horizontal magnetic field. Let an electric current be passed through the coil; then, as Ampère showed, the coil will begin to turn so as to set itself perpendicularly to the lines of force. At every half swing towards the final position of equilibrium the current in the coil is diminished; at every half swing away from this position there is increase of current in the coil. This is an example of the phenomenon known as magneto-electric induction, and it is due wholly to the fact that the number of lines of magnetic force included by the coil is changing.

Put quite generally, the principle is simply this: when a closed circuit and a magnetic field are moving relatively one to the other in such a way that the number of lines of force included by the circuit is changing, an induced E.M.F. is set up, which is measured by the rate of change in the included number of lines of force. The particular manner in which the change is produced may vary. There may be motion of a coil near a magnet or of a magnet near a coil, as in dynamos of various construction; or there may be the establishing of a primary current in one coil, bringing into existence a magnetic field within a neighboring coil, in which, accordingly, a secondary or induced current flows at the instant of establishing of the field. This is the principle of the induction coil. In some cases the coil is not of simple form, and may, indeed, not form a closed circuit. The effect may, therefore, also be regarded as produced by the passage of the conductor through the magnetic field, so as to cut across the lines of force. Then the E.M.F. produced = number of lines of force cut by conductor per second. This is used to define the unit of E.M.F., as that produced when a conductor cuts one line of force per second: 1 volt = 10^8 units of this size.

The question as to the direction of the in-

duced E.M.F. in relation to the direction of the inducing field may be at once answered by an appeal to the principle of the conservation of energy. Let the induced current be produced by the approach of a magnet to a coil, and suppose the north end of the magnet to be the nearer end, then evidently the magnetic effect of the induced current must be so as to resist the change which is producing it. For if it acted with the change, the induced current would accelerate the motion of the magnet, and this acceleration would increase the induced current, and so on indefinitely with an increasing velocity of the magnet, and no work done to account for it. Hence the magnetic effect of the induced currents must always be such as to resist the magnetic change which produced it. This is known as Lenz' law. An important case is that of the induction in one circuit due to a primary current established in a neighboring circuit. At make of the primary the induced secondary current is in the reverse direction to the primary, and at break it is in the same direction. This plays an important part in the theory and construction of DYNAMOS.

Self-induction.—Since an E.M.F. is induced in a coil during a change in the number of lines of force passing through it, this effect will also occur in the coil when a current is started, stopped, or changed in itself, and by Lenz' law the action is directed to prevent the change. This can only be done by preventing the change in the current. Therefore, when a current is increasing, there is an E.M.F. set up in the coil opposing its increase, and therefore opposing the battery E.M.F.; while during its decrease the induced E.M.F. will help the battery to keep up the current. The success is only partial, since the E.M.F. owes its existence to the change in the current; but it tends to prevent any rapid change in a current. This is known as the E.M.F. of self-induction.

Mechanical Action of Currents.—If a current is sent through a conductor which lies in a magnetic field, a force is developed on the conductor, which tends to move it across the lines of force. This is the principle of the electric motor. The value of the force is proportional to the continued product of the current into the magnetic field into the length of the conductor in the field, or $= H I$ dynes per centimetre of conductor, where H and I are the values of magnetic field and current measured in c.g.s. units. The direction of the force is reversed by reversing the current, and also by reversing the magnetic field,

and is such that the motion it produces will set up, by moving across the magnetic field, an E.M.F. opposing the current. This is an extension of Lenz' law.

Thermo-electricity.—When a circuit is formed of two or more different conductors, and any junction is made to assume a temperature different from the rest of the circuit, an electro-motive force is brought into existence, causing a current to flow in a determinate direction around the circuit. In all cases the thermo-electric E.M.F. is much smaller than is obtained from a voltaic cell; but within a certain range its value varies greatly, according to the nature of the metals which form the junction. Thus antimony and bismuth give for a definite rise of temperature a greater E.M.F. than any other pair of metals. Iron and copper give a much smaller E.M.F., and gold and silver still smaller. The phenomenon is utilized in the construction of the thermopile, which, in combination with a delicate galvanometer, forms an extremely sensitive thermometer.

Closely connected with the production of the thermo-electric current are the Peltier effect and the Thomson effect. The former is observed as a heating or cooling effect when a current is made to pass across the junction of two different conductors. It is, in fact, the reverse of the thermo-electric current; and the direction of the Peltier effect is always such as to produce a thermo-electric E.M.F., which acts against the current which gave rise to the Peltier effect. The Thomson effect was first discovered by Lord Kelvin as a result of thermo-dynamic theory applied to thermo-electric phenomena, and was afterward verified by him experimentally. It is a heating or cooling effect by a current passing along a single conductor, of which the temperature changes from point to point. It may be regarded as of the same ultimate character as the Peltier effect, if we consider the same metal at different temperatures to be really different metals in an electrical sense.

The many important practical applications of current electricity are treated under appropriate headings. See also ELECTRO-MAGNETIC WAVES.

Consult Faraday's *Researches* (1839-55); Clerk-Maxwell's *Electricity and Magnetism* (3d ed. 1892); Timbie and Bush's *Principles of Electrical Engineering* (1922).

Electricity, Distribution of. The essential conditions of the distribution of electricity by *continuous current* are stated in the section ELECTRIC POWER TRANSMISSION.

Constant-pressure System.—In all cases where the area over which current is required does not extend far from the dynamo machines, there is no difficulty in maintaining a sufficiently constant pressure, and this system is invariably employed. Thus for the lighting of isolated houses and the distribution of power over factories, a simple generating station, with one or more dynamos and engines and a battery of storage cells, supplies current at a definite pressure to the mains in the building. A small excess of pressure, some four or five per cent., may be allowed for loss in the mains, and no further compensation is needed. The standard pressure in such cases is from 100 to 120 volts, if the farthest point at which current is used lies within three or four hundred yards. When this distance is exceeded a higher pressure is usually found to be more economical, and from 200 to 220 volts may be adopted; but the special requirements of the case often influence the decision. The effect of raising the pressure of supply is twofold. A particular lamp or motor absorbs a certain amount of power, and this is represented from an electrical point of view as the product of pressure multiplied by current. Hence by doubling the pressure the current required is reduced to one-half, and the mains will be similarly diminished in size. The economy of a high pressure is therefore very considerable if the distances are large.

Increase of pressure beyond a certain value is not desirable, owing to the increasing liability to breakdown of some part of the installation, and still more on account of the dangerous nature of electric shocks at high pressure.

Feeder System.—While a small and compact village may be supplied on the simple system described above, the limit is soon reached, and additional help is required. The simplest method is that invented by Edison, and known as the feeder system. Whereas in the previous arrangement the pressure at the dynamo is kept nearly constant, in the feeder system electric cables, called 'feeders,' are run out to some distance, and the farther ends are considered as sources of supply at constant pressure. The loss of pressure in the feeder does not affect the lamps, since the dynamo is caused to deliver an extra pressure, compensating for this.

Three-Wire System.—A method of doubling the pressure in the mains, while keeping unchanged the pressure on the lamps, was also successfully devised by Edison. His sys-

tem employs three wires instead of two, called 'positive,' 'middle,' and 'negative.' The normal pressure for the lamps is 200 volts, then between positive and middle wires is a pressure of 200 volts, and the middle wire represents the negative or return wire to the positive. Lamps and motors are connected between these two in the ordinary way. But between middle, or neutral, and

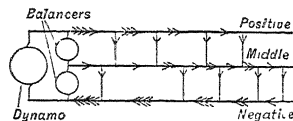


Diagram of Three-wire System.

negative there is also a 200-volt pressure, the neutral being the outward or positive wire to the negative; and this pair also serves for connecting apparatus. If one side only has lamps in use, the neutral wire performs its function for that side as described above; but if both sides have the same number of lamps, current flows out by the positive and back by the negative, while the neutral wire is idle. When the number of lamps on the two sides is different, the excess of current required by the one side over the other flows along the neutral wire to or from the station, according as the positive or negative side is the more heavily loaded. The system has almost the economy of a 400-volt system, while allowing the use of 200-volt apparatus; for by a careful arrangement of the lamps in a town, the number in use on each side may be kept approximately equal, and the neutral wire, carrying only a small current, can be made much smaller than the outer wires.

The accompanying figure shows a diagram of a three-wire system in its simplest form, with four lamps between positive and neutral, and five lamps on the other side. The value of the current and its direction in each part of the mains is indicated by arrow-heads. The balancers supply current for one lamp, and the dynamo supplies current for four lamps in addition to the current taken by the balancers.

It is customary to connect the neutral conductor to ground either at the central station alone, or at various points in the system. This practice prevents the voltage to ground of an outside conductor from exceeding the lamp voltage.

Distribution at High Pressure with Transformers.—Mention must be made of a third continuous-current system, in which the dy-

namous supply current at high pressure—one or two thousand volts—to the feeders, and at the far ends of the feeders are placed machines called motor-dynamos, by which the small high-pressure current is transformed into a large current at low pressure. This is fed into the network in the ordinary way by a two- or three-wire system. Some ten years ago this system appeared to have advantages of economy over the low-pressure continuous current, and of convenience over the alternating-current systems; but improvements in alternating-current methods have rendered it more suitable for long-distance transmission. The main advantage of alternating over continuous current systems is their ease of transformation. Their main disadvantages are: they cannot be used in connection with secondary or storage cells; and for certain purposes, such as for lighting, tramway and railway work, electrolytic work, etc., they are either totally unsuitable or not nearly so good as direct current. The larger and more scattered the district, the greater is the economy effected by the use of an alternating current system. In such cases, the alternating current would be generated at a high pressure, and supplied to transformers, a transformer being provided for each house or group of houses. Such an arrangement is known as the 'house-transformer' system.

In some of the existing systems the distributing network for an alternating current supply is practically identical with that used in connection with continuous currents, a three-wire system being generally employed. Instead of having a transformer to each house or group of houses, the consumers' wiring is connected to a low-pressure distributing network of mains, and this network is fed at a certain number of feeding points by groups of transformers placed in suitably constructed underground chambers known as 'transformer substations.' Such a system is known as a transformer substation system of distribution, and is much more commonly used than the house-transformer system, which is only suitable for scattered residential districts. If the insulation between the primary and secondary coils of a transformer should break down, then the potential above earth of the secondary and everything in connection with it, including the wiring of the consumer, might rise to a dangerous extent, so that there would be considerable risk of life in the case of any person happening to come into contact with

any portion of the wiring. In order to prevent this, it is becoming steadily the practice to ground the secondary circuit of transformers permanently. Ground may be made effectively either on a main water-supply pipe or by a sheet of copper buried in crushed coke at a depth sufficient to secure permanent moisture. See ELECTRICAL SUPPLY. Consult Kapp's *Electric Transmission of Energy, and its Transformation, Sub-division, and Distribution*; Sprague's *The Transmission of Power by Electricity*; Bell's *Electric Power Transmission*; Snell's *Distribution of Electrical Energy*; Brew's *Three-phase Transmission* (1911); Ferguson's *The Elements of Electrical Transmission* (1911).

Electricity in Medicine and Surgery.

In this age of electricity, medicine and surgery are keeping pace with industry in utilizing electrical currents in a great variety of ways. Electricity is used to light lamps for diagnosis and treatment, to light x-ray tubes and cause the formation of x-rays and also the current itself is utilized in many of its forms to actually treat diseased conditions. The makers of ordinary incandescent lamps have refined their art to such an extent that it is now possible to manufacture very small but powerful lamps that can be used to explore the innermost cavities of the body, and these lamps are made in such a way that they are easily sterilized and can be controlled by a small rheostat so that any degree of illumination is possible. Trans-illumination is a method of diagnosis, wherein these small, powerful lamps are used to make light pass from the inside through tissues so that it can be detected on the outer surface of the body.

Light such as is given by incandescent bulbs is also used in the treatment of many diseases. Bulbs are made with filaments of carbonized bamboo, similar to the old-fashioned lights, and there are also bulbs in use which are of very high wattage and whose filaments are made of tungsten so that the lamp does not give off so much actual heat but a greater volume of light. Treatments with these incandescent bulbs are called treatments with radiant light and the electrical energy transformed into light shines upon the body and penetrates to some extent beneath the skin, where this light energy is applied and becomes heat. The use of light in treatment is not restricted to the light that can be seen. There are available many forms of lamps which generate

invisible light of wave lengths longer and shorter than the wave lengths the eye can detect. Science is continually working to make these vital rays more available because we now know that many diseases are caused by the use of ordinary window glass which keeps out all the beneficial rays of the sun. The common disease called 'rickets' is a case in point. There is a new glass now on the market called 'Vitaglass' which transmits a good proportion of the vital rays of the sun and is being used extensively in this country and abroad in hospitals, sanatoriums, homes and offices.

Ultraviolet light for use in the treatment of disease is generated by arcing an electrical current. The greatest source of ultraviolet light today is an arc made by breaking an electrical current passing through a column of mercury. This mercury is kept in control by putting it in a tube made of pure fused quartz, since quartz is the only substance that transmits all the vital ultraviolet light produced. Quartz, however, cannot be used for windows as yet because it is far too expensive. If the scale of light waves is followed to its shortest possible length, the shortest waves that can be utilized at present are those emitted by radium. Very recently Professor Millikan identified a ray called the 'cosmic ray,' which is even shorter than the shortest rays of radium, and Dr. Bucky has recently published very marvellous results for the use of a wave length of about 4 A.U. Inasmuch as this wave length is on a border line between the ultraviolet zone and the x-ray zone, Dr. Bucky has called it the 'Grenz ray.'

This completes the entire scale of oscillations that are classified as light, from the shortest, the cosmic ray, through x-ray and the Grenz ray and then the far, middle and near ultraviolet, the visible spectrum and infra red. Infra red occupies the greatest zone in the scale and these wave lengths become so long that they merge into the wave lengths used in radio today. All these oscillations of the ether are generated by electricity and all have their uses in the field of therapeutics. X-rays, frequently called 'Crooke's Rays' or 'Roentgen Rays,' were discovered originally by the great physicist, Crooke of England. He was not working for something that would go through the body but rather trying to break up the atom and was interested purely from a physicist's viewpoint. Consequently the real discoverer was Crooke, but the man to find out the modern useful-

ness of x-ray, as it is thought of today in connection with medicine and surgery, was Roentgen. For the past thirty years x-rays have been used to look through the body for opaque material and as an aid in diagnosis of disease. Early in the work with x-ray it was discovered that these rays have a peculiar action upon tissues of the body, which action has been more and more investigated with a view to solving the great question of the treatment of cancer and other such conditions where operation is inadvisable.

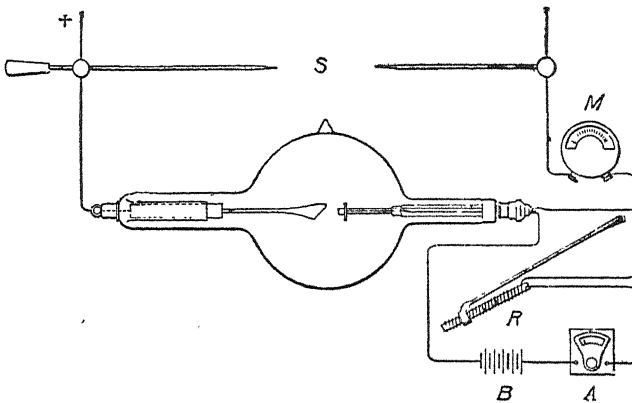
Inasmuch as x-rays are stopped by certain metals and heavy substances and consequently these substances throw a shadow on a photographic plate, many uses are made of this fact to help diagnose the position of tissues within the body. The intestines and stomach frequently are filled with an opaque substance such as barium sulphate and the passage of this substance through the entire gastro-intestinal tract can then be watched on a fluoroscopic screen upon which the shadows are cast by the x-ray; or the progress of the 'meal' can be photographed at intervals and a permanent record made upon photographic films. Dr. Coolidge of the General Electrical Company originated the tube now in use which bears his name. This tube is exhausted to such a high degree of vacuum that one can always count on the rays being the same in quality and quantity when the amount of current put into the tube is the same.

In the scale of light energy, the penetration power varies greatly. The gamma rays of radium and x-rays have a high power of penetration, whereas the alpha and beta rays penetrate but a short distance beneath the skin. The Grenz ray penetrates even less because it is so much like ultraviolet light and ultraviolet rays have practically no power of penetration, having all their effect upon the metabolism of the body by acting upon substances in the skin. Light of the spectral variety, which can be perceived by the eye, will penetrate through a slight amount of living tissue, as can be seen when it is used for transillumination as mentioned above. Infra red rays have very little penetrating power until they get so long that they are practically radio waves and then they assume the powers of great penetration, traveling through all sorts of substances just as do radio waves.

Polarity Effects.—One pole being positive creates certain effects in tissues such as releasing nascent oxygen, hence it has an anti-

septic action. It causes constriction of tissue, is astringent, stops hemorrhage and also has a sedative action upon nerve endings. Conversely the negative pole has no antiseptic action but releases nascent hydrogen. It does not constrict but softens tissue and consequently promotes the flow of blood; instead of being an astringent, it is the opposite and will cause hemorrhage. Moreover, the action of the negative pole on nerve endings is the opposite of the positive pole and it is therefore quite irritating. These chemical effects of the galvanic current are utilized in the treatment of different conditions. Another effect is demonstrated by Faraday's well

as is desired and when it is reversing at the speed of sixty times per second, it then becomes what is commercially known as the 'alternating current.' This ordinary alternating current is therapeutically useless so that machines giving a regulation A.C. are of no use in medicine and surgery. If, however, these alternations are trebled we then get a current that is useful in stimulating muscle and as we increase the speed of alternations until they get a million or more per second, we arrive at the currents known as 'high frequency currents.' Two variations of interrupted galvanism which are used in Europe but not so often in this country are the Leduc



Coolidge X-ray Tube, with High and Low Tension Circuits.

known 'ice pail experiment' which showed that like charged bodies repel each other. This makes it possible to take certain metals that are electrically positive and by placing them on the positive electrode connected with a source of galvanic current they are electrically forced into the tissues to a slight depth. In the same way negatively charged substances, such as alkaloids and bases, can be repelled by the negative pole and so forced into tissues. Contrary to the old original idea these substances cannot be passed entirely through a part such as a knee joint or shoulder but drugs can be forced sufficiently deep so that they are absorbed by circulation. The sinusoidal current, reversing its polarity at each phase, does not have any of these polarity effects and is a means whereby we can utilize the power of the galvanic current to cause muscles to contract without considering such effects.

The sinusoidal current may be made to alternate in its direction of flow as quickly

and the Leduc currents. The Leduc current is an extremely sedative form of interrupted galvanism, where the time of the complete cycle is divided into tenths; that is, the period of rest between shocks is nine times the duration of the period of stimulation, but the shocks are administered at the rate of about two hundred per second, consequently, they are of very short duration. The Leduc current has been used for some time for a sedative form of stimulation of muscle. Some years ago Dr. Rabinowitz used it on the brains of rabbits and was able to produce an electrical form of sleep. The experiment gained great publicity, but when it was tried upon human beings, the same effect was not produced and consequently its use has been dropped. The Leduc current is administered by a special apparatus that causes the make of a current to be slowed up so that when the circuit is closed, the current reaches its full strength very gradually and then slowly drops to zero. It has

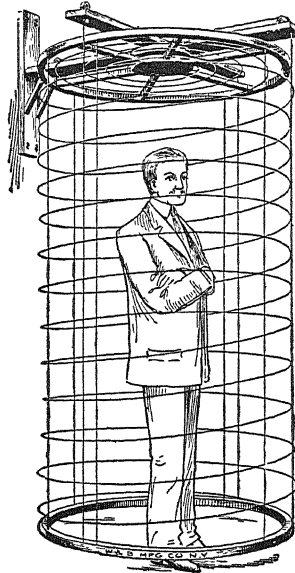
been used a great deal in Europe because it is found that when used in a weak form, paralyzed muscles will react, whereas normal muscles will not. For this reason it is helpful in showing patients just what motions they should practise to re-educate paralyzed muscles. The use of this current is considered a better means of telling whether or not nerves are degenerated than the formerly accepted method of using ordinary galvanic electricity to produce the so-called Reaction of Degeneration.

High frequency currents in electrical medicine are currents that alternate in their direction of flowing at a speed greater than five thousand times per second. Over thirty years ago d'Arsonval discovered that if such a current is administered to any part of the body the stimulation is such that it produces no nervous nor muscular response. He gradually worked up methods of producing these high speeds of alternation, and work along this line has progressed until now there are machines which can produce alternations at the rate of over three million times per second. It is a well known law of electricity and physics that any portion of an electrical circuit that is of greater resistance than the rest will slow up the passage of any electrical current and when energy in motion is slowed up, heat is produced. This factor is the cause of the use of high frequency electricity today, for parts of patients' bodies are purposely introduced into the circuit of high frequency electricity and heat is produced throughout the path in the tissues through which this high frequency current passes. The entire path in the body is not heated equally because the normal protective mechanism of the body which helps to overcome any kind of irritation, such as heat, causes the blood vessels to be dilated so that much of the heat produced by the high frequency current is carried away to cooler parts of the body.

By means of this high frequency technique, generally called 'Diathermy,' heat has been produced in tissue up to a temperature of 270°F. For the treatment of deep-seated cancers this current frequently is used to actually cook and destroy the tumors under the skin without affecting the skin on the surface.

Autocondensation is another method of administering the d'Arsonval current, where one terminal is connected with a series of metal plates which are placed on the under side of a nonconducting material such as thick glass or a fibre cushion through which

the current cannot pass. The other terminal of the machine is connected with a handle which is held by the patient and in this way the patient becomes a coating of a Leyden jar or condenser and consequently the current is condensed in the patient, hence the name. *Autoconduction* is still another means that was originally utilized to administer the d'Arsonval current generally, but is not near-



*High - Frequency Currents.
Treatment in Auto-Conduction
Cage.*

ly as effective as autocondensation. This technique is carried out by placing the patient within a very large solenoid, as illustrated, when the current passing through the solenoid electrically creates a current in the patient, who is a resistance and consequently becomes heated. Autoconduction is not used in the United States but is sometimes utilized in France.

Static Electricity is another form of electrical current originally used in therapeutics. The galvanic current was not known until 1800, whereas the static current was in use two hundred years before and was originally described as a method of treating diseases in a book published as early as 1650. Static electricity is a current that flows in one direction and can be produced only by a machine known as a static machine. Such machines today are generally of ten to twenty-four plates of glass revolving

near some stationary plates of glass. The friction of the chemically dried air within the cabinet causes the formation of the frictional or Franklinic current that has been misnamed static electricity. The term 'static electricity' probably comes from the fact that it will remain stationary or static within a machine and when the plates are reversed, it will be produced without any chemical activity. Static electricity can be produced by rubbing the feet along heavy carpet and is purely the result of friction. Electrically it is described as a current of extremely high pressure or voltage and of minimum volume or amperage.

All electrical modalities should be administered only by medically trained physicians, whose knowledge of the underlying pathology is sufficient to make them understand why certain electrical modalities should be used. With the exception of the specific effect of ultraviolet light on rickets and the actual destruction of tissue by means of electrodeiccation or electrocoagulation, there is nothing in the field of electrotherapeutics which can stand alone as a method of cure for any diseases.

Electricity, Progress since 1934. Corresponding with the increase in kilowatt-hour consumption during the last several years there was an increase in the use and manufacture of industrial and home equipment. The most notable development along these lines was replacement of the conventional cooling systems by the enormous hydrogen-cooling plants installed in industrial houses, business offices, and places of entertainment.

In transportation fields the most marked improvement was seen in the development of Diesel-electric equipment, for both street railways and locomotives. In 1936 a two-unit locomotive with 3,600-horsepower capacity was installed by one railroad. Electrification of leading railroads was rapidly being brought to an all-comprehensive state. High speed locomotives, to offset the competition of airplanes, were constantly pressed into service.

Variable-voltage drives on placer dredges in conjunction with alternating-current motors for other drives made their appearance so that considerable operating time was saved in addition to a 15 percent reduction in kilowatt-hours per yard used. And in a companion industry, the largest-capacity shovel yet constructed (rated 32 cubic yards) was put into service in coal-mining. This shovel holds 48 tons, the net working weight

being about 1300 tons. Notwithstanding the tremendous power of the machine, it can be handled with little difficulty.

In one steel mill in 1935 apparatus equivalent to 39,000 horsepower was installed. In the domestic field time and labor saving devices served to step up consumption of kilowatt-hours. An electrical kitchen waste machine was on the market which virtually did away with the garbage pail. Food waste is fed to the machine which grinds it to a pulp and then disposes it down the drain like the waste water. Refrigerators were made quieter, more economical and more durable. A new electrically controlled steam water heater was produced whereby heat from the steam is released to the water by means of an hermetically sealed heat transfer system which utilizes water vapor as the heat carrying medium.

Air conditioning for residences and business establishments showed increased popularity and is now available for both summer and winter comfort. A new departure in central plant air conditioning was in the development of unit assembly air conditioners. These provide a group of standard heating, cooling, humidifying, filtering and air circulating elements which are so related to each other that they may be assembled in different combinations to meet a great variety of air conditioning requirements. An interesting development was the application of the heat-pump principle, consisting of an installation of refrigeration equipment both to heat and cool buildings.

Keeping pace with other innovations were the improvements in the use of x-ray apparatus for industrial as well as medical use. An x-ray therapy apparatus rated 200 kilovolts at 18 milliamperes, constant potential, employs a voltage-doubling circuit using a high tension transformer which produces approximately 50 percent of the output voltage equipment and is now in medical use. In industrial plants x-rays were effectively used to detect foreign substances in foodstuffs.

A new warning to criminals was given with the perfecting of two-way communication in police radio equipment. A portable transceiver, which is a combination transmitter and receiver, is so small that the complete equipment including the antenna can be carried in an ordinary suitcase.

Radio sets were continually being improved. The receiving sets were more compact, better protected, had longer life, better tone and increased short-wave response.

Most progress resulted from the use of all-metal tubes. The conventional airplane dial with its multiplicity of curved scales was replaced by an illuminated cylinder with the scales for the various bands printed in straight lines on its surface to approximate the scale of a slide rule. The cylinder is geared to rotate with the band change switch so that only the band to which the switch is set is visible through the escutcheon window.

Among the many instruments devised for special measurements were a line of pressure and temperature indicators for aircraft, a railway speedometer utilizing a small alternating-current generator to give speed indications. An improved photoelectric spectrophotometer which plots in graphic form the spectral reflectance and spectral transmission data for a variety of materials, a time interval comparator for use with electric furnaces, a cycle recorder to facilitate welding operations—all these are now in use.

The new lamps produced included a double bar filament prefocused automobile headlight lamp in which the lower-intensity light beam is directed to the right and downward, clearly illuminating the right side of the road and thereby encouraging the motorist to use the lower level of illumination when meeting other cars. A new luminaire, 50 percent more efficient than its most efficient predecessor, was designed for street lighting. A new beam for airport and airway service utilizes a three lens system to produce from a single light source a high candle-power beam together with a lower candle-power spread beam.

Vitamin Light Bulb—This consists in an electric light bulb which provides the vitamin preventing rickets without burning or tanning. It can be used effectively on any electric lamp socket. A special glass envelope filters out the light rays below Angstrom units which do damage to human tissue. The new bulb is, in fact, two bulbs—the inner one of corex glass, operating as an ultra-violet lamp (which radiates very little light) and a larger outside bulb which is a tungsten filament providing lighting rays in the usual fashion.

The 'Electric Eye,' or the photo-electric cell, as it is known by technicians, ushered in an electric age that threatens to release man from toil at a rate that, unless the device is wisely used, will seriously dislocate social progress. Made possible by the electron tube, we already have instruments that hear, feel, taste and smell as well as see, and we have the super-eye, radar. See RADAR. Consult R. F. Yates, *Super-Electricity* (1942).

Electric Lamps. Electric lamps fall naturally into three classes: (1) arc, (2) incandescent filament, (3) gaseous glow-lamps. Of these the second is by far the most common, the arc having in recent years become obsolescent, and the gaseous being thus far restricted to novelty lighting and to certain special purposes.

Arc Lamps.—This is the oldest form of artificial electric light. If two carbon rods, connected to the terminals of a battery or generator developing an electromotive force of 50 or more volts, are brought into contact and are slightly separated, current continues to flow across the gap, producing a brilliant light. If the carbons are horizontal the glowing vapor curves upward in the form of an arc, hence the name.

The various forms of arc lamp all had certain features in common: (1) holders for the positive and negative electrodes, with connections for the current, (2) mechanism, usually operated automatically by electromagnets for (a) 'sticking the arc' by bringing the electrodes together and then separating them about $1/8$ to $1/4$ inch, (b) feeding the electrodes forward as they were gradually consumed.

In the direct-current arc the positive tip soon takes the form of a vividly incandescent crater from which 85 to 90 per cent. of the light is emitted; the remainder comes from the negative tip and the arc stream, which latter imparts a distinctly violet tinge.

In the flame-arc the carbons are impregnated with calcium fluoride or other salts. These are usually carried in a core softer than the outer shell. The arc then takes the form of a luminous flame much longer than the carbon arc, and with much higher efficiency. The color depends on the chemical used, calcium fluoride giving an intense golden yellow, with an efficiency approximating three times that of the open carbon-arc. These lamps require direct current; in localities supplied with alternating current, mercury-arc rectifiers are installed to make the necessary conversion, fifty or more lamps being connected in series to each rectifier.

In recent years arc lamps for general lighting have been largely superseded by large incandescent lamps, the arc being retained to some extent for powerful projection lanterns, but more particularly for search-lights.

Incandescent Lamps.—The story of the incandescent lamp is centered around the discovery of certain physical facts and of the laws governing them, followed by successive

technical advances in applying them practically. Primarily its operation is based on the following phenomena:—(1) When an electric current is made to flow in a piece of conducting material the latter becomes heated; the heat developed depends on its electrical resistance and the strength of the current. Electrical energy is consumed, being converted into radiant heat and, if the temperature is high enough, light. (2) As the temperature is raised above the point at which light begins to be given off, the color changes from a dull red and becomes more and more nearly white. At the same time the amount of light given off increases more than the energy consumed. Hence it would be best, on the score of efficiency, to operate an incandescent filament at the highest possible temperature. This restricts the choice of materials to those having a high melting or high vaporizing point. (3) Since practically all the available materials will oxidize they must be heated in a vacuum or in an inert gas such as nitrogen or argon. (4) The presence of an inert gas reduces the tendency of the filament material to vaporize, and thus permits of operation at a higher temperature with consequent gain in efficiency, but introduces a heat loss by convection which becomes more serious the thinner the filament.

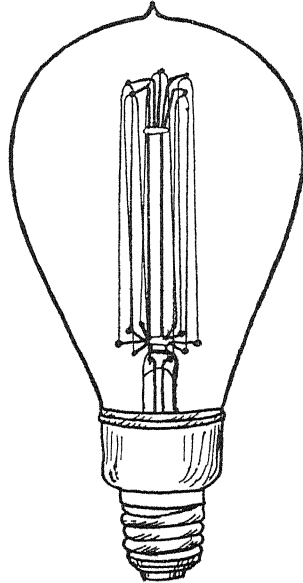
Carbon Lamp.—In October, 1879, Thomas A. Edison made a lamp with a carbonized thread for a filament, sealed in an air-tight glass bulb from which the air had been exhausted. In the first commercial lamps bamboo fibres were used. Subsequent improvements included changes in the base, resulting finally in the well known screw-shell type. The normal rating is based on an average life for a number of lamps of about 1,000 hours of burning.

Metallic Filament Lamp.—With progress in chemical technology, including the availability of electrical methods of treatment, filaments of osmium, tantalum and tungsten were successively developed.

Tungsten Lamp.—The commercial career of the tantalum lamp was cut short by the appearance, in 1907, of a metal-filament lamp using tungsten, which soon superseded the former, but the extreme fragility of the filaments was a serious drawback.

About 1910 the difficulty was solved by the introduction of a process developed by Coolidge for converting tungsten from a brittle, commercially infusible and unworkable metal to a ductile material that could be drawn into fine wires of high tensile strength. Until 1913

the filament was operated in a vacuum. In that year a gain in the efficiency of the lamps was obtained by using an inert gas in the bulbs. At first this was done only with the larger sizes, 750 and 1,000 watts, the gas being nitrogen. Progressively the invention was



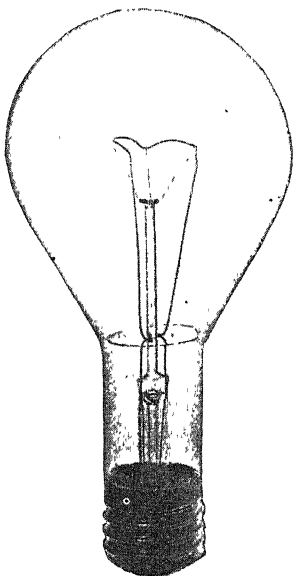
Tungsten-Filament Lamp.

applied to smaller lamps, down to the 50-watt size; in these, the bulbs were filled with argon. To reduce the glare due to the brilliantly incandescent filament various forms of frosting or enamel finish have been used: early in 1926 a method of inside frosting, by etching the glass, was introduced. The light from tungsten lamps is whiter than that from the old carbon-filament lamps, especially in the larger sizes, but is nevertheless appreciably yellower than ordinary daylight. In order to approach the latter more closely, lamps known as 'Mazda C2' are made with bulbs of bluish glass, by which the excess of red and yellow is absorbed; the efficiency is, however, reduced by about 30 per cent.

Characteristics.—With a few exceptions, incandescent lamps are usually operated in parallel on constant-potential circuits. That is, substantially the same voltage is applied to all lamps on the entire system. By far the most common voltage for these circuits is around 115 volts. The rate of a lamp, *i.e.*, the voltage which it is designed to be operated, is determined by a compromise between efficiency and

length of life. The latter is commonly taken at or somewhat over 1,000 hours.

Tungsten Arc Incandescent Lamp.—A lamp of moderate candle power giving its light from practically a point source makes use of the incandescence of a tungsten globule mounted on a stem and constituting the positive terminal of an arc, which differs from the carbon arc in the important feature that it requires no adjustment, mechanical starting or feeding.



Gas-filled 'Mazda C'

The lamps are made in sizes from 30 c.p. up, the construction of the larger units and those for operation on alternating current differing somewhat from that here described. Because of the concentrated light source they are useful for projection and other optical purposes.

Efficiencies.—Lamp efficiencies were formerly expressed in watts per candle. Since the candle power in all practical cases varies with the direction, it was necessary to add a qualifying term. The average of candle power measurements in all directions in a horizontal plane, the lamp being held tip-up or tip-down, gave mean horizontal candle power, the average in all directions gave mean spherical; in all from the horizontal downward it gave mean lower hemispherical. In modern practice the entire output of the lamp is measured in lumens (see ILLUMINATION), and the efficiency is expressed in lumens per watt.

Vacuum Tube Lamps.—When the atoms of

a gas or vapor are made luminous, by electrical means, heat is also produced, but the apparent temperature is not related to the quality of the light except as a certain temperature may be necessary for the existence of metallic vapor in quantity. This is the reverse of the relation of temperature to luminescence in solids. Vapors may be made luminous in electric arcs as with the calcium and titanium lamps. The mercury-vapor lamp develops an arc, but in a vacuum tube. The complete lamp for direct current comprises an inclined tube and holder and a small set of inductance and resistance coils connected in series with the tube. The tube has an iron electrode at the upper or positive end, and a small amount of mercury in the bulb or negative end. The tubes are made in lengths of about 21 and 45 inches, with a diameter of about 1 inch, for candle powers of 300 and 700, respectively, for the general groups of voltages about 110 and 220, respectively.

The mercury tube, considered alone, has a peculiar characteristic whereby it experiences momentary increases of resistance of sufficient magnitude to break the arc. It has been found necessary to introduce inductance into the circuit so that the magnetic energy stored opposes and overcomes the tendency to reduce the current. The lamp may be employed to great advantage for purposes where a considerable illumination is required, and where the practically monochromatic light serves as an aid to acuity of vision.

Neon Light.—A form of illuminant, thus far used chiefly for novelty and display lighting and substantially similar in principle to the Moore light, makes use of the rare gas neon as the light source. This gas, which constitutes about 1/66,000 of the atmosphere, is obtained as a by-product of the oxygen industry, and purified. A small quantity is admitted to a highly evacuated glass tube provided with a metal electrode at each end, and glows throughout its length with an orange-red color when a current is passed through it. Compared with incandescent lamps the applied voltage is high and the current small. The tubes are therefore not served directly from the ordinary 60-cycle supply circuits, but by way of small step-up transformers, which raise the voltage to a suitable value depending on their dimensions. For a tube 1/4 inch in diameter and 15 feet long it is about 6,000 volts, the current being around 0.025 ampere.

Because the conductivity increases with increasing current, the tube is unstable electrically on a constant potential supply; special transformers are used to meet this characteris-

tic. The life is stated to be 4,000 to 5,000 hours, thus greatly exceeding that of incandescent lamps. The gas then has to be replenished; during use it is gradually absorbed or disappears.

The commonest present use of neon lamps in the United States is for signs. The tubes are formed into letters or other shapes; the striking color, the continuous lines of light and an efficiency apparently comparable with that of the incandescent lamp, are the chief characteristics for that application. A color variation has been obtained by introducing into the tube a few drops of mercury. The latter vaporizes, and the light becomes blue.

An entirely different form of neon lamp has recently been developed and was put on the market in the United States in 1926. It has a screw-base, like the ordinary incandescent lamp, but a much smaller bulb, and is designed for use on common lighting circuits. Like the tube light, this lamp makes use of the glow discharge, but the light is very feeble, the energy consumption being correspondingly small. The lamps are not intended for general illumination, but rather as markers in the dark. The light source is, again, the orange-red glow of neon. Two small cylindrical electrodes, separated by a few hundredths of an inch, are surrounded with a sort of corona when connected to a 110- or 115-volt circuit.

Electric Lighting, History of. Several centuries before the Christian era a Greek philosopher named Thales noted the fact that if amber is rubbed it will attract light objects. The Greek word for amber was 'elektron,' whence our word electricity. Some centuries later Aristotle wrote that the lodestone would attract iron; lodestone is an iron ore having magnetic qualities and is now known as magnetite. The best specimens of lodestone came from Magnesia, hence our word 'magnet.'

But in 1800 came the epoch-making discovery of Volta, who found that electricity could be generated by chemical means. To demonstrate his point he made a pile of silver and zinc discs with cloths wet with salt water between them. This was the forerunner of the present day primary battery. In his honor the volt, the unit of electrical pressure, was named.

A few years later Sir Humphrey Davy demonstrated that electric current can heat carbon and metal strips to incandescence and give light and that the current will give a brilliant flame between the ends of two carbon pencils which are allowed to touch each other and then pulled apart, *i.e.*, the arc light.

André Marie Ampère, professor of mathe-

matics in the Polytechnic School in Paris, in 1820 discovered that if an electric current is passed through a coiled wire, the coil obtains the properties of a magnet. The ampere, the unit of flow of electric current, is named in his honor. Ohm's Law, one of the fundamental laws of electricity, was demonstrated in 1825 by George Ohm, who showed the relation between the voltage, amperage and resistance in an electric circuit, and for whom the unit of electric resistance is named. Michael Faraday, a British scientist, in 1831 discovered that electricity could be generated by means of a permanent magnet, a principle now used in all dynamos. Since that time various developments have been made and in the early seventies commercial dynamos were available for use in arc lighting. In 1806 Sir Charles Wheatstone invented the 'self-excited' dynamo now universally used. In 1840 Sir William Grove demonstrated his incandescent lamp in which platinum was made incandescent by means of a current flowing through it.

The first arc lamp was patented in 1845; eleven years later the 'differential' method of control of the arc was discovered, whose use was universally established about 1876, with the commercial establishment of the arc lamp. The year 1862 witnessed the first commercial installation of an electric light when an English lighthouse installed an arc light.

Arc light systems were commercially established in the United States in 1877-8, and the following year Thomas Edison invented an incandescent lamp, consisting of a high resistance carbon filament operating in a high vacuum maintained by an all-glass globe, the principle now used in all incandescent lamps, and also a new system of distributing electricity at constant pressure, now in universal use. Other important inventions which have proved commercially valuable are Stanley's constant pressure alternating current system of distribution (1886); Bremer's flame arc lamp (1898); Nernst's lamp (1900); Moore's vacuum tube light (1904); von Welsbach's osmium incandescent lamp (1905); Just and Hanaman's tungsten filament incandescent lamp (1907); Coolidge's drawn tungsten wire (1911); and Langmuir's gas-filled tungsten filament incandescent lamp (1913).

Some idea of the present enormous use of electric lighting may be gained from the fact that in the United States today there are more than 350,000,000 incandescent and 200,000,000 magnetite arc lamps in use and there is an annual increase of about 10 per cent. About 85 per cent. of all lamps are for 110-voltage and

the most popular lamp is the 40-watt size. The use of incandescent lamps in all other countries together about equals that in the United States.

Electric Lighting of Streets. The illumination of streets was one of the first applications of electric lights, and in many of the smaller communities it was the very first application of all. In the United States two 'systems' were first to offer practical street lighting. Each was the product of a pioneer inventor and each was promoted by a pioneer electrical manufacturing company.

Each of these inventors developed first of all a practical and fairly efficient dynamo electric machine, then an arc lamp to be used with the dynamo. They increased the capacity of their dynamos until one machine could supply fifty or sixty arc lamps. The circuits required from six to ten amperes of direct current and the pressure at the terminals of the lamps ranged from forty to fifty volts.

Meanwhile Thomas A. Edison had introduced his incandescent lamp for lighting interiors, operating on multiple circuits at 110 volts. In 1885 he adapted this system for street lighting under the title of the Edison Municipal System, with incandescent lamps of 16 and 32 candle power, and circuits of 1,200 volts.

The arc lamp, however, continued to dominate street lighting in the United States, the early lamps continuing more or less unchanged and being manufactured, after 1892, by the General Electric Company, which inherited all the early work of both Brush and Thomson, as well as Edison. About 1895 the so-called enclosed arc lamp appeared.

Ten years later there came a revolutionary development, in the magnetite, or luminous, arc lamp, perfected from an original idea of Dr. Charles P. Steinmetz, who suggested replacing the carbon electrodes with one containing magnetite. About 1916, New Haven installed the first General Electric system of ornamental luminous arc lamps, and attracted wide attention.

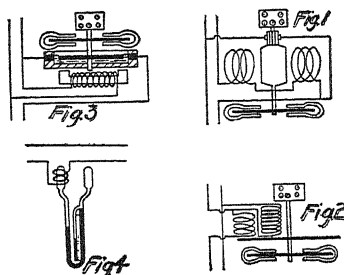
The use of incandescent lamps for street lighting had languished until it again came to the front with the invention, about 1912, of the tungsten gas-filled incandescent lamp, permitting high candle power lamps to be manufactured. Up to 1911, tungsten vacuum lamps were being made as high as 350 candle power. Since then, and up to the present time, tungsten gas-filled lamps have been made in units of 1,000, 2,000 and 2,500 candle power, and some notable installations of street lights have

employed incandescent lamps of these high candle powers

Electric Meters, a popular but loose expression, generally meaning *integrating watt-meters*, or *watt-hour meters*, which register total electrical energy furnished.

Watt-hour Meters are small, delicate motors, usually having jewel bearings, so designed and adjusted that their speed depends on the energy supplied to the circuit on which they are connected. A counting device registers total revolutions, which are calibrated to show corresponding value in energy units. There are three types of such meters: (1) The Thomson, (2) the induction, (3) the Faraday disc.

The *Thomson or commutator meter* (Fig. 1) is a complete little direct-current motor, made without iron parts. The armature shaft is vertical, and carries at its upper end a silver commutator and a revolution counter. Near the opposite end is a large copper disc, revolving between the poles of two or more C-shaped permanent magnets. The armature is connected across (parallel) the supply circuit, so that the armature current is proportional to the voltages. All the current supply passes through the field coils, so that the force causing the armature to revolve is proportional to the circuit voltage times the current supplied (see



Types of Meters.

DYNAMOS AND MOTORS); i.e., to the watts, which is the power or the rate of supplying energy. The armature speed is made to increase directly as does the driving force or torque; therefore the speed, or rate of turning, is proportional to the rate at which work is done (or energy is furnished) in the circuit, and the total revolutions are proportional to the total energy, or watt-hours. The copper disc mentioned revolves between the poles of the permanent magnets; eddy currents are generated in the disc proportional to the speed, and produce a magnetic reaction on the C-magnets, which is also proportional to the

speed. The effect is to keep the speed always proportional to the driving force.

The *induction meter* (Fig. 2) is in reality a small induction motor with revolving magnetic field polarity produced by two field coils—one connected in series with the supply circuit, and other in parallel; so that the one carries the current supplied and the other the voltage. The disc brake used on the commutator motor is used here, also, to keep the speed always proportional to torque. When the current and voltage are in phase—that is to say, have their maximum and minimum values occur simultaneously—the rotating element is threaded by two magnetic fluxes a quarter-cycle (90 degrees) apart electrically, and coming from coils 90 degrees mechanically. This is a condition for producing a rotating magnetic polarity which depends on the product of the two fluxes, and is proportional to the product of current and voltage.

The *Faraday-disc type* (so-called from its similarity to Faraday's early dynamo) is represented by the *Sangamo watt-hour meter* (Fig. 3), put out to overcome commutator and friction troubles and cost in the Thomson type. A copper disc armature floats in mercury, which serves as a bearing and to carry the current to the armature. Under the edge of the disc, diametrically opposite, are the field-magnet poles. The main current flows across the disc, and the shunt coil, carrying full-line voltage, excites the field. The meter acts like the Thomson type on direct current. The same sort of magnetic brake is necessary as with other meters.

Maximum-Demand Meters.—In the sale of electrical energy in the larger quantities, an effort is often made to charge in proportion to the cost of rendering the service. This necessitates the determination of the maximum power draft of the individual consumer. The sustained value of this 'demand' for a predetermined period, such as fifteen or thirty minutes, is of importance in basing the charges as well as is the consumption in kilowatt-hours. Instruments designed to indicate or record maximum-demand are called *demand meters*. There are several types: (1) the thermal, (2) the induction integrating (usually with time lag), (3) the graphic.

The thermal type is best represented by the *Wright maximum ampere-demand indicator* (Fig. 4). A colored liquid is hermetically sealed in a U-tube; the main current, or a definite fraction, passes around a bulb, expands the air, and raises one leg of the double liquid column until it spills over into the central branch. The amount of spill depends on the

heat developed in the bulb, which in turn depends on the current (approximately as its square). This indicator is purposely lagged or, in other words, made slow in its indications. Thus, if the maximum current lasts four minutes, the meter shows only 90 per cent. of the maximum; in ten minutes, 97 per cent. is shown; in forty minutes, 100 per cent.

The induction principle is employed in the *integrating demand meter*, either as a separate device or in conjunction with an ordinary watt-hour meter. Inasmuch as a record of the instantaneous demand is not in general desired, it is necessary to provide a time-lag in the indication so that only an integrated value for the predetermined time period will be recorded. This is accomplished in various ways; for example, the speed of rotation of the adjunct watt-hour meter is transmitted in impulses to the demand indicator, and the timing-period, during which the demand pointed is advanced by these impulses, is regulated by an inductively driven disc running at constant speed. After a given number of revolutions (*i.e.*, given time) the disc actuates the resetting of the demand mechanism. The pointer, however, retains its extreme deflection until reset by the meter reader.

The *graphic demand meter* not only indicates the maximum demand during a definite time interval but also shows the time of occurrence and duration of each demand.

Electric Motors. See **Dynamos and Motors.**

Electric Ore Finder. Attempts have been frequently made to employ electricity and magnetism as aids in locating metalliferous deposits. Such methods are not accepted by mining and electrical engineers, and their promoters are generally considered to be self-deceived, if not worse.

Electric Power Transmission: Direct- and Alternating-current Systems. Among the more important advantages possessed by the electrical method of power transmission may be mentioned (1) the extraordinarily high efficiency of transmission, which need never fall below 50 per cent., and is in most cases about 90 per cent.; (2) the high efficiency of all forms of electric motor, even at small loads; (3) the great flexibility of the system, which allows of a change of position of the motor without involving great expense.

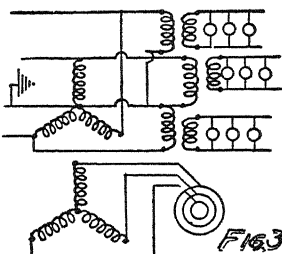
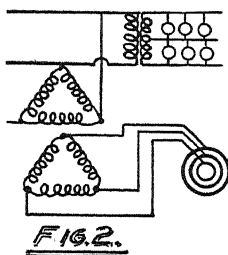
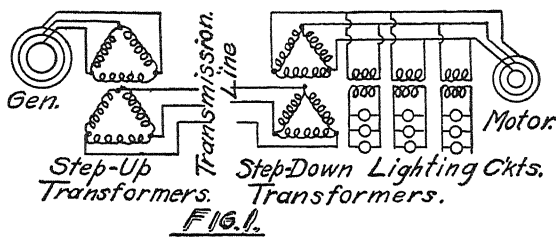
We have really to consider two distinct problems. In one case, only short distances are involved; in the other, the reverse is true. See **ELECTRICITY, DISTRIBUTION OF.**

The two greatest applications of electric

energy are in *lighting* and *mechanical power*, though electric heating in industry and in the household is of growing importance. With modern equipment for controlling and regulating the voltage delivered to the ultimate consumer, it has become possible to render all these different kinds of service from one universal system, the alternating current system, and street lighting, house lighting and appliance service, industrial power and heat processes, street railway power, are all served from the same generating units through appropriate transformation and conversion apparatus. When certain mechanical requirements, such

generation, transmission, and distribution, while Figs. 2 and 3 show only the distribution lines. In Fig. 1 three single-phase lighting circuits are led off from a three-phase line supplying a three-phase motor. In Fig. 3 the motor circuit is drawn from a separate set of main step-down transformers. In Fig. 2 a three-wire single-phase lighting circuit is drawn from one phase of the three-phase power line.

Long-distance Transmission.—For long-distance transmission—as is often necessary in using electricity from a waterfall—some permissible loss (say 10 per cent.) is decided on.



Alternating-Current, Power, and Lighting-Circuit Diagrams.

as variable-speed machine drive, demand direct-current motors, it may be necessary to put in rotary converters to transform the alternating current to direct. Such a conversion is also common for electric railways. Direct-current distribution systems are still found in a few thickly settled areas; but the alternating-current system is employed for all other situations. (See ELECTRICAL SUPPLY.)

A complication is encountered with alternating current. The lamps have but one pair of terminals, and lighting service is best served by a simple, single-phase line, while mechanical power is best obtained from poly-phase motors requiring at least three feed wires. The problem is to combine single-phase lighting with poly-phase power circuits. Three of the most common arrangements are shown in Figs. 1, 2, and 3. Fig. 1 shows a system of

This is chiefly heat, I^2R , where I = amperes, and R = ohms (see ELECTRICITY, CURRENT). If the I^2R is to remain at the same percentage as the distance of transmission increases, either the current or the resistance per mile, or both, must be cut down.

The system *par excellence* for long distances is the alternating-current, on account of the simplicity and efficiency of raising and lowering voltages with the 'static' transformer (see TRANSFORMER). A typical alternating-current system (see Fig. 1) has (1) 11,000 volt, three-phase generators; (2) step-up transformers, to raise the voltage up to 66,000 for transmission; (3) a three-wire transmission line 50 miles long; (4) step-down transformers, reducing the voltage to 4,600 or 2,300 for the distributing lines; (5) motors connected directly to the 2,300 line, or through transformers that reduce

the voltage to 220; (6) local single-phase lighting-lines run from 110- or 220-volt transformers attached to the 2,300 distribution circuit.

Cost of transformers and the loss in transformation would be saved by designing the generators for the line voltage. Such an arrangement has been adopted where the pressure is not above 13,000 volts, but for higher pressures the insulation of the armature coils presents considerable difficulties—difficulties which may be overcome in the case of transformers by immersing them in oil, and thus enormously increasing the dielectric strength.

The first successful commercial line in the world, transmitting current over long distances at very high voltages, was constructed in 1892 between San Bernardino and Pomona, California. The line was 28 3/4 miles long, and transmitted 800 H.P. at 10,000 volts single-phase. To-day the distances have increased to over 200 miles and the voltages to as high as 220,000, with 500,000 in contemplation. The large electrical manufacturing companies have installed testing and experimental outfits of as high as 2,000,000 volts.

From 11,000 to 22,000 is the common voltage, to-day, up to 20 miles. Above this the lowest common voltage is 33,000—as there is neither advantage nor economy in building for lower voltage, if step-up transformers have to be used. The next step is 44,000 for still longer lines. Several 66,000 and 110,000-volt lines are being successfully operated.

Transmission lines have to be equipped to protect against *lightning*. The term lightning is sometimes used in power transmission to cover all sorts of high-voltage, high-frequency disturbances, whether caused by atmospheric discharges onto the line, or by internal surges due—for instance—to opening and closing switches under heavy load. The object of *lightning arresters* is to discharge harmlessly into the earth whatever abnormal voltage charges, or currents, appear on the transmission line. Prevention of atmospheric discharges is best obtained by one or more overhead 'ground wires' attached to the tops of the transmission towers and connected to the earth at intervals. There are two classes of devices for leading undesirable currents or charges from the line: (1) spark gaps which may be jumped by the abnormal potentials, but not by normal voltages; (2) electrolytic resistances which break down and conduct when the excess of potential is reached. (See LIGHTNING ARRESTERS.)

In power transmission the wires may be of copper or aluminum, the latter being about twice the size, half the weight, and 90 per cent. of the cost of copper. The high-potential wires are commonly uninsulated, and strung overhead. If this design is carefully worked out, with good construction, it is reliable. The supports are commonly chestnut, cedar, or redwood poles, with yellow pine cross arms to receive locust wood or iron pins bearing the insulators. Steel towers are often used with the longest distance and highest voltage lines; each costs from 25 to 50 times as much as a pole, but spans may be longer, with decreased leakage loss and maintenance expenses. There is, with steel towers, a greater safeguard of the investment and reliability of service. The insulators may be held upon a wood or iron pin and support the wire from below, or each may be a series of insulating barriers in a suspension chain holding the wires from above.

In cities it is common to put the low-tension distributing wires in iron pipes, or wooden and earthenware conduits underground, in order to prevent unsightly streets and to avoid the disastrous effects of storms. (See SUBWAYS; ELECTRIC CABLES AND CONDUCTOR.) Sometimes it is necessary similarly to bury high-tension circuits, when special cables of high insulation strength have to be used. Such cables have been made for 110,000 volts (single-conductor) and 66,000 volts (three-conductor).

The contribution of electronics to the power industry promises to be very great. Heretofore it has not been possible to transmit current other than high-voltage alternating current, for technicians have not known how to generate high-voltage direct current. If this could be done, current could be stepped up to voltages that could be pushed through long transmission lines without appreciable losses, and the power industry would save many millions of dollars.

A new tube, the thyatron, an electronic device, promises that the much-needed high-voltage direct current will be available and that it will benefit both the manufacturer and the user of electric power.

Consult Painton's *Mechanical Design of Overhead Electrical Transmission Lines* (1925); Taylot and Neale's *Electrical Design of Overhead Power Transmission Lines* (1925); Woodruff's *Electric Power Transmission and Distribution* (1925).

Electric Ray. See **Torpedo.**



Electric Telegraph. See **Telegraphy.**

